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# BRITISH ANTARCTIC ("TERRA NOVA") EXPEDITION, 1910.

## NATURAL HISTORY REPORT.

QL 637.2 R33 1914 Fishes

ZOOLOGY. VOL. I.—No. 1, pp. 1–54.

# FISHES.

BY

C TATE REGAN, M.A.

WITH EIGHT FIGURES IN THE TEXT AND PLATES I–XIII.

B. M. (N.H.)

Smithsonian Institution GILL COLLECTION 236044 National Museum

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BRITISH MUSEUM (NATURAL HISTORY).

# BRITISH ANTARCTIC ("TERRA NOVA") EXPEDITION, 1910.

## NATURAL HISTORY REPORT.

## ZOOLOGY.

The Trustees of the British Museum have undertaken the publication of the Natural History results of the British Antarctic Expedition, 1910, conducted by the s.s. "Terra Nova," under the command of the late Capt. R. F. Scott, R.N., C.V.O. Arrangements for working out most of the groups collected have already been made.

Mr. C. Tate Regan's Memoir on Fishes is the part which is ready for publication first. It may be useful to explain that it is proposed to issue the Zoological Reports, from time to time, as they are ready for publication. By adopting this method the delay which results from waiting until a volume is completed may be avoided; but, on the other hand, a natural sequence of subjects can hardly be maintained.

The plan that will be adopted will be to distribute the subject-matter provisionally among as many volumes as seem likely to be required. No attempt will be made to complete a volume before commencing the publication of its successor; and two or more volumes may accordingly be in process of publication concurrently. When a volume has reached a convenient size it will be completed by the issue of a title-page and table of contents.

SIDNEY F. HARMER.
*Keeper of Zoology.*

British Museum (Natural History).
London, S.W.
*June* 27, 1914.

# FISHES.

BY C. TATE REGAN, M.A.

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## I.—SYSTEMATIC PART.

### 1. THE ANTARCTIC FISHES.

The collection includes examples of twenty-five species, twelve of which have been described as new to science in a preliminary note (Ann. Mag. Nat. Hist. (8) XIII, 1914, pp. 11–14), four of these being new generic types. This large proportion of new forms is doubtless due to the fact that the bulk of the collection was dredged at depths varying from about 50 to 250 fathoms. All but three of the species belong to the group Nototheniiformes, and the additions to our knowledge of the genus *Trematomus*, the Harpagiferinae and the Chaenichthyidae, are of considerable importance. A new genus of the Bathydraconidae resembles the northern Cottid *Icelus* in its armature of spinate bony plates, and the first Antarctic species of *Paraliparis* is of interest.

MYCTOPHIDAE.

1. *Myctophum antarcticum*, Günth.

55° 6′ S., 120° 3′ W., surface.

MURAENOLEPIDAE.

2. *Muraenolepis microps*, Lönnb. (Pl. II, fig. 2).

*Muraenolepis marmoratus microps*, Lönnberg, Swedish S. Polar Exped. Fish., p. 43 (1905).

Depth of body 6 in the length, length of head $4\frac{1}{2}$. Length of snout 3, diameter of eye 5 in length of head, equal to or a little less than interocular width, much greater

than interorbital width. Barbel $\frac{1}{5}$ or $\frac{1}{6}$ length of head. Maxillary extending to below anterior part or middle of eye. Dorsal filament (absent in one specimen) longer than diameter of eye, inserted a little behind base of pectoral. Anal origin only a little in advance of middle of length of fish. Pectoral $\frac{1}{2}$ to $\frac{3}{5}$, pelvics $\frac{3}{4}$ length of head. Greyish.

Here described from two specimens, 130 and 140 mm. in total length, from off new land south of the Balleny Islands; depth 200 fathoms.

These seem to belong to the same species as a small fish (55 mm.) from the South Sandwich Islands, which is doubtless identical with Lönnberg's *M. microps* from South Georgia. *M. marmoratus*, Günth., from Kerguelen, has a somewhat deeper body and shorter head, larger eye, shorter barbel and dorsal filament. *M. orangiensis*, Vaill., from Magellan, seems to be more slender and to have a smaller head and longer barbel than either of the other species, from which it differs also in the much longer tail, more than $1\frac{1}{2}$ as long as the rest of the fish.

## Nototheniidae.

### Nototheniinae.

#### *Trematomus*, Bouleng.

The known species of this genus number fourteen (or thirteen if *T. dubius* be the young of *T. vicarius*), from the coasts of the Antarctic Continent and South Georgia. In addition to three new species the "Terra Nova" obtained examples of two formerly placed in *Notothenia*, enabling me to examine the pectoral arch and to assign them to their correct position.

*Synopsis of the Species.*

I. Upper surface of head naked.

A. Cheeks and opercles fully scaled.

Interorbital width $3\frac{1}{3}$ to 5 in length of head. D. VI–VIII, 32–38. A. 32–36 . . *newnesii.*

Interorbital width 8 or 9 in length of head. D. IV, 37. A. 32–33 . . . *nicolai.*

B. Cheeks and opercles scaly above, naked below.

D. V–VI, 34–37. A. 31–33 . . . . . *borchgrevinkii.*

D. IV–V, 30–33. A. 29–30 . . . . . *brachysoma.*

II. Occiput scaly; cheeks and opercles fully scaled.

A. Interorbital region naked, or incompletely scaled. D. IV–VI, 33–38. A. 31–35.

Interorbital region naked, or with a single median series of scales; diameter of eye 3 (young) to $4\frac{1}{3}$ (adult) in length of head; 60 to 75 scales in a longitudinal series *bernacchii.*

Interorbital region with two or three series of scales in the middle; diameter of eye $4\frac{3}{5}$ (adult) in length of head; 56 to 59 scales in a longitudinal series . . . . *vicarius.*

Interorbital region naked; diameter of eye $3\frac{2}{3}$ (young) in length of head; 55 scales in a longitudinal series . . . . . *dubius.*

B. Interorbital region fully scaled; praeorbital naked.

1. 60 to 75 scales in a longitudinal series, 34 to 46 in upper lateral line.

D. VI–VII, 36–41. A. 33–36 . . . . . *hansoni.*

D. V–VII, 31–35. A. 31–35 . . . . . *loennbergii.*

2. 52 to 56 scales in a longitudinal series, 30 to 36 in upper lateral line.
D. v–vi, 32–35. A. 29–32.
Dorsal spines flexible . . . . . *pennellii.*
Dorsal spines pungent . . . . . *centronotus.*

C. Interorbital region fully scaled; praeorbital scaly.
Snout and lower jaw naked. D. iv–vi, 31–34. A. 29–32. 46 to 54 scales in a longitudinal series . . . . . *scotti.*
Snout and lower jaw scaly. D. vi–vii, 31–33. A. 34–36. 70 to 80 scales in a longitudinal series . . . . . *lepidorhinus.*
Snout and lower jaw scaly. D. vi, 35–36. A. 33–34. 70 scales in a longitudinal series . . . . . *eulepidotus.*

3. *Trematomus brachysoma*, Pappenh. (Pl. ii, fig. 3).

A specimen of 170 mm. in total length, stranded on an ice floe in 67° 24′ S., 177° 34′ W. A water-colour sketch made by Mr. Lillie shows the body purplish gray, and the fins blue, with the dark spots of the same tint as the colour of the body.

4. *Trematomus bernacchii*, Bouleng. (Pl. i, fig. 1).

Cape Evans and off Cape Adare, 45 to 50 fathoms; bottom shingle.

5. *Trematomus hansoni*, Bouleng. (Pl. i, fig. 2).

A large number of examples of this and the preceding species were caught in 1911 at the winter quarters, Cape Evans, by means of a fish trap made of wire netting stiffened by iron hoops and bars, which was lowered through holes in the ice. It was noted that when a new hole was tried one or two good catches would result, and then no more at all, perhaps because the attention of Weddell Seals had been attracted. The fish were eaten and had a distinctly sweetish taste.

Three water-colour sketches were made by Dr. Wilson to show the natural coloration; two of these are reproduced on Plate I.

6. *Trematomus loennbergii*, Regan.

*Trematomus loennbergii*, Regan, Trans. R. Soc. Edinburgh, xlix, 1913, p. 263, pl. viii, f. 4.

Depth of body 4 to 5 in the length, length of head 3 to $3\frac{3}{4}$. Diameter of eye 3 to $3\frac{1}{2}$ in length of head, interorbital width 6 to 10. Maxillary extending to below anterior $\frac{1}{4}$ or $\frac{1}{3}$ of eye; upper surface of head to nostrils, cheeks and opercles scaly. 10 to 13 gill-rakers on lower part of anterior arch. Dorsal v–vii, 31–35. Anal 31–35. Pectoral nearly as long as head; pelvics reaching anal. Caudal rounded or subtruncate. Caudal peduncle as long as or longer than deep. 60 to 75 scales in a longitudinal series, 34 to 46 in upper lateral line; lower lateral line, when developed, sometimes with as many as 15 tubules. Body with irregular dark cross-bars.

Several examples up to 190 mm. in total length, from off new land south of the Balleny Islands, at a depth of 200 fathoms, from near Inaccessible Island, 222 to 241 fathoms, and from the entrance to McMurdo Sound, 77° 13′ S., 164° 18′ W., 207 fathoms.

7. *Trematomus pennellii*, Regan (Pl. III, fig. 2).

*Trematomus pennellii*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 12.

Depth of body $4\frac{1}{2}$ to 5 in the length, length of head $3\frac{1}{3}$ to $3\frac{1}{2}$. Diameter of eye $3\frac{1}{4}$ to $3\frac{1}{2}$ in length of head, interorbital width 8 to 10. Maxillary extending to below anterior $\frac{1}{4}$ of eye; occiput, interorbital region, cheeks and opercles scaly. 13 to 16 gill-rakers on lower part of anterior arch. Dorsal V–VI, 32–34; spines flexible. Anal 30. Pectoral $\frac{3}{4}$ or $\frac{4}{5}$ length of head; pelvics extending to origin of anal. Caudal subtruncate. Caudal peduncle as long as deep. 52 to 56 scales in a longitudinal series from above base of pectoral fin to caudal, 32 to 36 in upper lateral line; lower lateral line without tubules. Olivaceous, with two or three series of large dark spots which may unite to form irregular cross-bars.

Off Cape Adare; 45 to 50 fathoms; bottom shingle. Five specimens, 100 to 140 mm. in total length.

This species is named after Commander H. L. L. Pennell, R.N.

8. *Trematomus centronotus*, Regan (Pl. III, fig. 1).

*Trematomus centronotus*, Regan, Ann. Mag. Nat. Hist. (8), XIII, 1914, p. 12.

Depth of body 4 in the length, length of head $3\frac{1}{3}$ to $3\frac{3}{5}$. Diameter of eye $3\frac{1}{4}$ in the length of head, interorbital width 10. Maxillary extending to below anterior $\frac{1}{4}$ or $\frac{1}{3}$ of eye; occiput, interorbital region, cheeks and opercles scaly. 14 gill-rakers on lower part of anterior arch. Dorsal V–VI, 32–35; spines stiff, pungent. Anal 29–32. Pectoral $\frac{3}{5}$ or $\frac{2}{3}$ length of head; pelvics extending to origin of anal. Caudal peduncle as long as deep. 52 to 56 scales in a longitudinal series from above base of pectoral fin to caudal, 30 to 36 in upper lateral line; lower lateral line without tubules. Large dark spots uniting to form irregular cross-bars.

Two specimens, 175 and 210 mm. in total length, from McMurdo Sound, 100 to 200 fathoms.

The pungent dorsal spines distinguish this species from all others of the genus, but it so closely resembles *T. pennellii* in other characters, scarcely differing except in the larger eye, that it is undesirable to place it in another genus.

9. *Trematomus scotti*, Bouleng. (Pl. IV, fig. 2).

*Notothenia scotti*, Bouleng. Nat. Antarct. Exped. Nat. Hist. II, Fish, p. 2, pl. I, f. 1 (1907); Regan, Trans. R. Soc. Edinb. XLIX, 1913, p. 271.

Depth of body 4 to $5\frac{1}{2}$ in the length, length of head 3 to $3\frac{3}{4}$. Diameter of eye $2\frac{4}{5}$ to $3\frac{1}{3}$ in length of head, interorbital width about 12. Maxillary extending to below anterior $\frac{1}{4}$ of eye; occiput, interorbital region, praeorbitals, cheeks and opercles scaly. 10 to 13 gill-rakers on lower part of anterior arch. Dorsal IV–VI, 31–34. Anal 29–32. Pectoral $\frac{3}{5}$ to $\frac{3}{4}$ length of head; pelvics reaching vent or anal fin. Caudal rounded. Caudal peduncle about as long as deep. 46 to 54 scales in a longitudinal series from above base of pectoral fin to caudal, 11 to 23 in upper lateral line; lower

lateral line without tubules. Body with dark spots or irregular cross-bars; spinous dorsal blackish; soft dorsal and anal with a blackish band which is broadest and most intense posteriorly; caudal, pectorals and pelvics barred. Vertebrae 15 + 32.

This species was known previously only from the type, a specimen of 110 mm. taken off the Ross Barrier at a depth of 300 fathoms. Numerous examples up to 180 mm. in total length were obtained by the "Terra Nova" in the following localities:—

Off new land south of the Balleny Islands, 200 fathoms.

Ross Sea, 74° 25′ S., 179° 3′ E., 158 fathoms.

Entrance to McMurdo Sound, 77° 13′ S., 164° 18′ E., 207 fathoms, and 76° 56′ S., 164° 12′ E., 160 fathoms.

McMurdo Sound, near Inaccessible Island, 222 to 241 fathoms.

10. *Trematomus lepidorhinus*, Pappenh. (Pl. IV, fig. 1).

*Notothenia lepidorhinus*, Pappenheim, Deutsche Südpolar-Exped. XIII, Zool. V, p. 169, pl. IX, f. 1, and pl. X, f. 1 (1912).

Three examples, 135 to 150 mm. in total length, from off new land south of the Balleny Islands, depth 200 fathoms. These have VI–VII, 31–33 dorsal and 34–35 anal rays, 75 to 80 scales in a lateral longitudinal series, and 14 to 16 gill-rakers on the lower part of the anterior arch.

I have examined the pectoral arch on both sides in all three specimens and find that the foramen is well within the hypercoracoid. I can only conclude that in exposing the foramen Pappenheim must have enlarged it ventralwards, which may easily occur unless care be taken.

11. *Trematomus eulepidotus*, Regan (Pl. IV, fig. 3).

*Trematomus eulepidotus*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 12.

Depth of body $3\frac{1}{2}$ to $4\frac{1}{2}$ in the length, length of head $3\frac{2}{5}$ to $3\frac{3}{4}$. Diameter of eye $3\frac{1}{3}$ to $3\frac{1}{2}$ in length of head, interorbital width $4\frac{1}{2}$ to 5. Maxillary extending to below anterior $\frac{1}{4}$ of eye; head covered with scales, only the lips naked. 14 or 15 gill-rakers on lower part of anterior arch. Dorsal VI, 35–36. Anal 33–34. Pectoral $\frac{2}{3}$ to $\frac{4}{5}$ length of head; pelvics extending to vent or origin of anal. Caudal truncate. Caudal peduncle as long, or nearly as long as deep. 70 scales in a longitudinal series from above pectoral fin to caudal, 42 to 46 in upper lateral line, 10 to 15 in lower. Sides of body with dark spots connected to form a network; dorsal fin with oblique dark stripes.

Two specimens, 140 and 165 mm. in total length, the smaller taken at the entrance to McMurdo Sound, 76° 56′ S., 164° 12′ W., at a depth of 160 fathoms, the larger from near Inaccessible Island, depth 222 to 241 fathoms. There are two larger examples, 220 and 250 mm., in bad condition, also from McMurdo Sound, taken off Granite Harbour at a depth of 50 fathoms.

Compared with examples of *T. lepidorhinus* of nearly the same size this species has a shorter snout, more oblique mouth and broader interorbital region. The tail is shorter, as the vent is nearly equidistant from tip of snout and end of anal fin, whereas it is much nearer the snout in *T. lepidorhinus*. The much shorter lower lateral line and the more numerous dorsal rays are further important differences.

12. *Pleuragramma antarcticum*, Bouleng.

Ross Sea, 158 fathoms. Cape Evans, frozen on an iceberg.

## Harpagiferinae.

The subfamily Harpagiferinae includes Nototheniids with the body naked, the gill-membranes broadly united to the isthmus and not forming a fold across it, the operculum hooked so that its upper edge is deeply concave, and the upper lateral line with tubules, the lower reduced to a series of pores.

The genera with a mental barbel were previously represented in the British Museum only by an example of *Dolloidraco longipinnis* recently received from Professor Roule, but the "Terra Nova" collection includes a large series of fishes of this group, representing six species.

### *Synopsis of the Genera of Harpagiferinae.*

I. A mental barbel; opercles not spinate.
- A. Post-temporal not prominent; head not or scarcely broader than deep; interorbital region narrow.
  - Spinous dorsal fin above base of pectoral . . . . . *Artedidraco*, Loennb.
  - Spinous dorsal fin above operculum . . . . . *Dolloidraco*, Roule.
- B. Upper limb of post-temporal projecting as a prominent curved ridge; spinous dorsal above operculum.
  - Head longer than broad, scarcely broader than deep; interorbital region narrow . . . . . *Histiodraco*, gen. nov.
  - Head as long as broad, much broader than deep; interorbital region wide . . . . . *Pogonophryne*, Regan.

II. No barbel; operculum and suboperculum each forming a prominent spine . *Harpagifer*, Richards.

### *Artedidraco*, Lönnberg.

*Artedidraco*, Lönnberg, Swedish South Polar Exped. Fish. p. 39 (1905).

Head without ridges or tubercles, covered with loose, smooth skin, longer than broad, not or scarcely broader than deep; interorbital region narrow. Post-temporal not prominent. Opercles not spinate. A mental barbel. Body compressed. Spinous dorsal fin above base of pectoral.

### *Synopsis of the Species.*

I. Barbel club-shaped, with papillose terminal knob.
- Depth of body 5 to $5\frac{1}{2}$ in the length, length of head $2\frac{5}{6}$ to 3. D. III–IV, 25. A. 17–18. Anterior rays of soft dorsal longest . . . . . *orianae*.
- Depth of body 4 in the length, length of head $2\frac{2}{3}$. D. III, 23–24. A. 17. Middle rays of soft dorsal longest . . . . . *mirus*.

II. Barbel without distal expansion, either smooth, finely papillose or slightly fringed.
A. Caudal rounded or subtruncate.
D. II–IV, 24–26. A. 17–20 . . . . . *skottsbergii.*
D. IV–V, 27–28. A. 19–20 . . . . . *shackletoni.*
B. Caudal slightly emarginate. D. II–III, 26–28. A. 18–21 . . . . . *loennbergii.*

13. *Artedidraco orianae*, Regan (Pl. VI, fig. 2).

*Artedidraco orianae*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 12.

Depth of body 5 to $5\frac{1}{2}$ in the length, length of head $2\frac{5}{6}$ to 3. Diameter of eye $3\frac{1}{2}$ in the length of head, interorbital width 10. Maxillary extending to below anterior $\frac{1}{4}$ of eye. Barbel $\frac{1}{4}$ length of head, club-shaped, with papillose distal expansion. Seven short gill-rakers on lower part of anterior arch. Dorsal III–IV, 25; rays of soft dorsal decreasing from third or fourth; last adnate to caudal peduncle. Anal 17–18, separated by an interspace from caudal fin. Pectoral 17-rayed, $\frac{5}{7}$ or $\frac{3}{4}$ length of head, extending to third or fourth ray of anal; pelvics as long, extending to vent or origin of anal. Caudal subtruncate. Five dark bars across back, extending upwards on the dorsal fins, the first at base of spinous dorsal, the second and fourth stronger than the rest; a spot on praeorbital, another on cheek; lower part of body irregularly spotted; fins with series of spots.

Two specimens, 80 mm. in total length, from off Cape Adare; depth 45 to 50 fathoms; bottom shingle.

The species is named in honour of Mrs. E. A. Wilson.

*A. mirus*, from South Georgia, described and figured by Lönnberg (Swedish South Polar Exped. Fish. p. 40, pl. IV, f. 14), from a specimen of 114 mm., appears to differ from *A. orianae* in the deeper body (depth 4 in the length), larger head ($2\frac{2}{3}$ in the length), longer barbel ($\frac{1}{3}$ the length of head), shorter paired fins (pectoral $\frac{2}{3}$, pelvics $\frac{1}{2}$ to $\frac{3}{5}$ length of head), higher soft dorsal with the middle rays longest and the last joined to the caudal fin, and in the absence of an interspace between anal and caudal.

14. *Artedidraco skottsbergii*, Lönnberg (Pl. V, fig. 1).

*Artedidraco skottsbergii*, Lönnberg, Swedish South Polar Exped. Fish. p. 48, pl. IV, f. 15 (1905); Vaillant, Expéd. Antarct. Française, Poiss. p. 46 (1906).

Depth of body $4\frac{1}{2}$ to $5\frac{1}{2}$ in the length, length of head 3 to $3\frac{1}{2}$. Diameter of eye 3 to $3\frac{3}{5}$ in the length of head, interorbital width about 14 to 20. Maxillary extending to below anterior $\frac{1}{4}$ of eye. Barbel simple, smooth or finely papillose, less than $\frac{1}{2}$ diameter of eye. Seven gill-rakers on lower part of anterior arch. Dorsal II–IV, 24–26. Anal 17–20. Pectoral with 15–17 rays, $\frac{3}{5}$ to $\frac{4}{5}$ length of head, extending to vent or origin of anal; pelvics shorter, barely reaching vent in young, not in adult. Caudal rounded or subtruncate. Body with numerous irregular dark spots; a series of blotches at base of dorsal fin sometimes continued on sides as bars; vertical fins with series of spots on the rays, those on posterior part of dorsal and anal and near upper and lower edges of caudal deep black; pectorals barred. Vertebrae 15 + 23.

Here described from 18 examples, up to 120 mm. in total length, from the entrance to McMurdo Sound, 76° 56′ S., 164° 12′ E., 160 fathoms; 77° 13′ S., 164° 18′ E., 207 fathoms; and off Granite Harbour, 50 fathoms. The species was known previously from Graham Land.

15. *Artedidraco shackletoni*, Waite.

*Artedidraco shackletoni*, Waite, Brit. Antarctic Exped. Fish. p. 15, pl. II (1911).

Depth of body 4 in the length, length of head $2\frac{3}{4}$ to $2\frac{4}{5}$. Diameter of eye $3\frac{1}{2}$ to $3\frac{3}{4}$ in length of head, interorbital width about 14. Maxillary extending to below middle of eye. Barbel smooth, tapering, $\frac{1}{5}$ to $\frac{2}{9}$ ($\frac{1}{4}$) length of head. Seven gill-rakers on lower part of anterior arch. Dorsal IV (V) 27–28; middle soft rays longest. Anal 19 (20). Pectoral with (15) 16–17 rays, $\frac{3}{5}$ length of head, extending to vent or origin of anal; pelvics shorter, not reaching vent. Caudal subtruncate. Uniform or finely speckled; caudal and pectorals spotted.

Here described from two examples, 132 and 142 mm. in total length, from the entrance to McMurdo Sound, 77° 13′ S., 164° 18′ E., 207 fathoms, and 76° 56′ S., 164° 12′ E., 160 fathoms. The type, 146 mm. in total length, from off Cape Royds at a depth of 30 to 80 fathoms, had V, 27 dorsal and 20 anal rays. It had the barbel a little longer (slightly more than $\frac{1}{4}$ the length of head), the spinous dorsal less, and the soft dorsal somewhat more elevated than in the specimens here described, but these differences are well within the limit of variation as shown by other species.

16. *Artedidraco loennbergii*, Roule (Pl. V, fig. 2).

*Artedidraco mirus* (part) Lönnberg, Swedish South Polar Exped. Fish. p. 40, pl. I, f. 4 (1905).
*Artedidraco loennbergii*, Roule, Deuxième Expéd. Antarct. Franç. Poiss. p. 13, pl. IV, f. 4 (1913).

Depth of body 5 to 6 in the length, length of head $2\frac{3}{4}$ to $3\frac{1}{4}$. Diameter of eye 3 to $3\frac{1}{2}$ in length of head; interorbital space very narrow. Maxillary extending to below anterior $\frac{1}{4}$ of eye. Barbel simple, or slightly fringed distally, $\frac{1}{7}$ to $\frac{1}{4}$ length of head. Six or seven gill-rakers on lower part of anterior arch. Dorsal II–III, 26–28. Anal 18–21. Soft dorsal and anal usually highest posteriorly. Pectoral with 14 to 16 rays, $\frac{3}{5}$ to $\frac{2}{3}$ length of head, reaching anal in young, but not in adult; pelvics reaching vent in young, but not in adult. Caudal slightly emarginate. A series of dark blotches at base of dorsal fin and sometimes at base of anal; a dark lateral band, made up of irregular spots, from eye to caudal fin; pale bands above and below it are continued along the upper and lower margins of the caudal fin; dorsal and middle of caudal with spots on the rays; pectorals usually barred.

Previously known from South Georgia and from Graham Land; here described from twenty-two examples measuring up to 110 mm. in total length from:—Ross Sea, 74° 25′ S., 179° 3′ E., 158 fathoms; off new land south of the Balleny Islands,

200 fathoms; McMurdo Sound, entrance, 76° 56′ S., 164° 12′ E., 160 fathoms and 77° 13′ S., 164° 18′ E., 207 fathoms, and near Inaccessible Island, 222 to 241 fathoms.

### *Histiodraco*, gen. nov.

Differs from *Dolloidraco* in that the upper limb of the post-temporal projects as a prominent curved ridge, as in *Pogonophryne*.

17. *Histiodraco velifer*, Regan (Pl. v, fig. 3).

*Dolloidraco velifer*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 12.

Depth of body 4 in the length, length of head $2\frac{2}{5}$. Diameter of eye $3\frac{1}{2}$ in the length of head, interorbital width 12. Maxillary extending to below middle of eye, or beyond. Barbel fringed in its distal half, $\frac{2}{5}$ the length of head. Seven very short gill-rakers on lower part of anterior arch. Dorsal II–III, 26; spinous dorsal short and high; soft dorsal elevated anteriorly, the longest rays $\frac{3}{4}$ to $\frac{9}{10}$ the length of head. Anal 17. Pectoral 19-rayed, $\frac{1}{2}$ length of head, extending to origin of anal; pelvics shorter. Caudal truncate above, rounded below, not more than $\frac{2}{3}$ length of head. Body marbled or irregularly barred; fins more or less spotted; caudal crossed by a dark band.

Two examples, 180 and 190 mm. in total length, from the entrance to McMurdo Sound, 77° 13′ S., 164° 18′ E., 207 fathoms.

### *Pogonophryne*, Regan.

*Pogonophryne*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 13.

Differs from *Histiodraco* in the wide interorbital region and the strongly depressed head, as broad as long and much broader than deep.

18. *Pogonophryne scotti*, Regan (Pl. VI, fig. 1).

*Pogonophryne scotti*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 13.

Depth of body 4 in the length, length of head $2\frac{1}{2}$. Diameter of eye $5\frac{1}{2}$ in length of head, interorbital width $4\frac{1}{2}$. Maxillary extending to below middle of eye; lower jaw strongly projecting. Barbel blunt, papillose, shorter than eye. 10 very short gill-rakers on lower part of anterior arch. Dorsal II, 25; spines low. Anal 18. Pectoral 19-rayed, $\frac{1}{2}$ length of head; pelvics short, rounded. Caudal rounded. Body finely spotted and marbled; fins with series of dark spots on the rays; caudal with a dark cross-bar.

A single specimen, 290 mm. in total length, from the Ross Sea, 74° 25′ S., 179° 3′ E., 158 fathoms.

A coloured drawing of a fish from the Bransfield Straits reproduced by Lönnberg (Swedish S. Polar Exped. Fish. pl. II, fig. 7) as *Artedidraco skottsbergii* seems rather to represent a *Pogonophryne*, perhaps even the species here described.

This species is named in memory of Captain R. F. Scott, R.N., C.V.O.

## Bathydraconidae.

*Gymnodraco*, with its depressed naked body, pointed snout, and compressed uniserial teeth with strong anterior canines, is connected with the genera with the body subcylindrical and more or less scaly, the snout spatulate, and the teeth villiform or cardiform, in bands, without canines, by the little known *Parachaenichthys*. Examples of *P. georgianus* Fisch. recently brought back from South Georgia by Mr. P. Stammwitz, show that *Parachaenichthys* has nothing to do with the Chaenichthyidae, but is a member of the Bathydraconidae, with the depressed form and naked body of *Gymnodraco*, but the mouth and teeth of *Bathydraco* and its allies.

In *Parachaenichthys* and *Gymnodraco* the feeble ribs are attached to the long epipleurals at some distance from the centra,* but in *Prionodraco* the ribs are stronger, are inserted directly on the short parapophyses and bear the epipleurals near their proximal ends.

### *Prionodraco*, Regan.

*Prionodraco*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 13.

Body elongate, compressed, quadrangular, with a series of V-shaped, serrated, bony plates at each angle; each plate with a backwardly directed spine. Lower series of plates ending in a group of nearly normal serrated scales behind pectoral fin; usually a series of similar scales along middle of side; body otherwise naked. Lateral line single, incomplete. Snout spatulate; mouth slightly protractile; teeth small, villiform, in bands. Vertebrae 16 + 34.

19. *Prionodraco evansii*, Regan (Pl. VII, fig. 1).

*Prionodraco evansii*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 13.

Depth of body 7 to 8 in the length, length of head 3 to $3\frac{1}{2}$. Snout as long as or a little longer than diameter of eye, which is 3 to $3\frac{1}{2}$ in length of head; interorbital width 15 or more in length of head. Lower jaw a little projecting; maxillary extending to below anterior margin of eye. Operculum ending in a flat antrorse hook. 18 gill-rakers on lower part of anterior arch. Dorsal 34–37. Anal 29–31. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, extending beyond origin of anal; pelvics not reaching the vent. Caudal rounded or subtruncate. About 50 plates in upper series; lateral line ending below anterior part of dorsal fin. Dark spots on body; usually a well-defined lateral series of large oblong or squarish spots; a blackish spot on base of anterior part of dorsal; dorsal, caudal and pectorals with series of spots on the rays.

Eleven specimens, measuring up to 132 mm. in total length, from the Ross Sea, 74° 25′ S., 179° 3′ E., 158 fathoms; and the entrance to McMurdo Sound, 76° 56′ S., 164° 12′ E., 160 fathoms, and 77° 13′ S., 164° 18′ E., 207 fathoms.

This species is named after Commander E. R. G. R. Evans, R.N., C.B.

* As in the Gobiesocidae, which also have the body depressed.

## CHAENICHTHYIDAE.

The "Terra Nova" collection includes examples of two species of a new genus of this family, and also new species of *Chionodraco* and *Cryodraco*, genera new to the British Museum collection. The synopsis of the genera given in the "Scotia" report may be modified as follows:—

I. Middle rays of pelvic fin longest; two lateral lines.
  A. Lateral line without bony plates.
    D. IX–X, 33–38. A. 32–38. no rostral spine . . . . . *Champsocephalus.*
    D. XII–XV, 28–31. A. 25–27. a rostral spine . . . . . *Pagetopsis.*
  B. Lateral line with bony plates; a rostral spine . . . . . *Chaenichthys.*

II. Two outer soft rays of pelvic fin longest.
  A. Sub- and inter- operculum not spinate; rostral spine reduced or absent.
    Pelvic fins comparatively short, with the rays branched or bifid; spinous dorsal large, of seven or eight spines, separated by a short interspace from soft dorsal; two lateral lines . . . . . *Chaenocephalus.*
    Pelvic fins long, with the rays simple: spinous dorsal reduced, of three to five spines, separated by a long interspace from soft dorsal; three lateral lines . *Cryodraco.*
  B. Sub- and inter- operculum bearing a pair of spines behind angle of praeoperculum; rostral spine well developed; three lateral lines.
    Pelvics I 5; gill-rakers reduced to a few vestiges near the angles of the arches *Chionodraco.*
    Pelvics I 4; gill-rakers developed as dentigerous knobs or patches . . *Chaenodraco.*

### 20. *Pagetopsis macropterus*, Bouleng.

Three examples from McMurdo Sound, 100 to 200 fathoms.

### 21. *Cryodraco atkinsoni*, Regan (Pl. VII, fig. 2).

*Cryodraco atkinsoni*, Regan, Ann. Mag. Nat. Hist. (8), XIII, 1914, p. 13.

Depth of body $7\frac{1}{2}$ in the length, length of head $3\frac{1}{4}$. Diameter of eye 5 in length of head, interorbital width $4\frac{2}{3}$. Snout $\frac{1}{2}$ the length of head. Maxillary nearly reaching middle of eye. Rostral spine and symphysial tubercle of mandibles vestigial. Dorsal III, 42; spinous dorsal above base of pectoral, its spines connected by membrane, the first and second subequal, $\frac{1}{4}$ the length of head. Anal 46; origin a little in advance of that of dorsal, nearer to end of snout than to base of caudal. Pectoral nearly $\frac{3}{5}$ length of head, extending to seventh ray of anal; pelvics $1\frac{1}{3}$ as long as head, extending to middle of dorsal fin. Caudal slightly emarginate. Dark spots on head and cross-bars on body; spinous dorsal blackish; pelvics dusky.

A single specimen, 292 mm. in total length, from the Ross Sea, 74° 25′ S., 179° 3′ E., 158 fathoms.

This species is named after Surg. E. L. Atkinson, R.N.; it differs from *C. antarcticus*, Dollo, in the smaller eye, shorter pelvic fins, etc. *C. pappenheimi*, Regan, has the pelvic fins still shorter, and in its large head and 5-rayed dorsal fin seems to approach *Chaenocephalus.*

*Chionodraco*, Lönnberg.

Body naked, elongate; three lateral lines without bony plates. Eye somewhat behind middle of head; supraorbital ridges crenulated; a rostral spine; teeth bi- or tri- serial; gill-rakers absent except for a few vestiges near the angles of the arches; sub- and inter- operculum bearing a pair of spines just behind angle of praeoperculum. Spinous dorsal well-developed, of six or seven spines; pelvics comparatively short, of a spine and five branched or bifid rays, the two outer the longest and enveloped in thick skin. Skeleton essentially similar to that of *Champsocephalus*. Vertebrae 64.

22. *Chionodraco kathleenae*, Regan (Pl. VIII).

*Chionodraco kathleenae*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 13.

Depth of body about 5 in the length, length of head $2\frac{3}{4}$ to 3. Diameter of eye 5 to 6 in length of head, interorbital width $3\frac{1}{2}$ to 4. Snout a little less than $\frac{1}{2}$ length of head. Rostral spine erect or retrorse. Maxillary extending to below anterior part or middle of eye. Dorsal VI–VII, 38–42, the two fins separated by an interspace. Anal 34–38. Pectoral $\frac{1}{2}$ length of head or a little more, extending to above vent or anterior rays of anal; pelvics $\frac{3}{5}$ to $\frac{3}{4}$ length of head, extending to origin of anal or beyond. Head and body with dark spots and bars; spinous dorsal blackish.

Five specimens, 250 to 500 mm. in total length, from the Ross Sea, 74° 25′ S., 179° 3′ E., 158 fathoms, and McMurdo Sound, 100–200 fathoms. Also an example in bad condition from off Granite Harbour, McMurdo Sound, 50 fathoms.

*C. hamatus*, Lönnberg, known from a specimen of 330 mm., has a larger eye ($4\frac{1}{3}$ in length of head, including opercular flap) and shorter pelvic fins, not reaching the vent.

This species is named in honour of Lady Scott.

*Chaenodraco*, Regan.

*Chaenodraco*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 13.

This genus differs from *Chionodraco* in having the supraorbital ridges not crenulated, the gill-rakers developed as dentigerous prominences, and the pelvic fins each formed of a spine and only four rays.

23. *Chaenodraco wilsoni*, Regan (Pl. IX, fig. 1).

*Chaenodraco wilsoni*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 14.

Depth of body 6 in the length, length of head $3\frac{1}{6}$. Snout $2\frac{2}{5}$, diameter of eye 4, interorbital width $3\frac{2}{3}$ in length of head. Maxillary extending to below anterior $\frac{1}{4}$ of eye. Rostral spine antrorse. Dorsal VII, 39, the two fins continuous at the base. Anal 33. Pectoral $\frac{3}{5}$ length of head, extending to third or fourth ray of anal; pelvics $\frac{5}{6}$ length of head, extending to seventh ray of anal; rays bifid. A large dark spot on the spinous dorsal.

A single specimen, 250 mm. in total length, from McMurdo Sound, 100 to 200 fathoms.

This species is named in memory of Dr. E. A. Wilson.

24. *Chaenodraco fasciatus*, Regan (Pl. IX, fig. 2).

*Chaenodraco fasciatus*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 14.

Depth of body 7 in the length, length of head $2\frac{3}{5}$. Snout $2\frac{1}{4}$ in length of head, diameter of eye $4\frac{1}{6}$, interorbital width $4\frac{1}{4}$. Maxillary extending to below anterior $\frac{1}{3}$ of eye. Rostral spine antrorse. Dorsal VII, 40, the two fins separate. Anal 34. Pectoral a little more than $\frac{3}{5}$ length of head, extending to seventh anal ray; pelvics as long as head, reaching fourteenth ray of anal. Body with five blackish cross-bars.

A single specimen, 92 mm. in total length, from McMurdo Sound, 77° 13′ S., 164° 18′ E., 207 fathoms.

The pelvic fin-rays are simple, doubtless a juvenile character. As the snout is proportionately longer and the eye smaller than in the much larger specimen of *C. wilsoni*, this cannot be the young of that species. The much greater distance between the last ray of the spinous dorsal and the first ray of the soft fin is also an important character.

### Cyclopteridae.

25. *Paraliparis antarcticus*, Regan (Pl. II, fig. 1).

*Paraliparis antarcticus*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 11.

Depth of body equal to or greater than length of head, which is 4 to $4\frac{1}{2}$ in the length of the fish. Snout obtuse, projecting a little beyond mouth, longer than diameter of eye, which is about 5 in the length of head. Maxillary extending to below posterior edge of eye; teeth villiform, in bands. Lower end of gill-opening opposite middle of base of pectoral. Dorsal 60; origin above extremity of operculum. Anal 55; origin below about ninth ray of dorsal. Pectoral of an upper portion, 19-rayed, $\frac{2}{3}$ to $\frac{3}{4}$ the length of head, extending a little beyond the origin of anal, connected by a low membrane including three or four short, spaced rays with a lower four- or five- rayed portion, as long as the upper and reaching the vent. Skin loose, transparent.

Three examples, 90 to 140 mm. in total length, from off new land south of the Balleny Islands, 200 fathoms.

## 2.—FISHES FROM NEW ZEALAND.

There are examples of thirty-four species, ten of which have been described as new to science (Ann. Mag. Nat. Hist. (8) XIII, 1914, pp. 14–16).

The fishes are from Cape North, unless otherwise stated.

### Scyliorhinidae.

1. *Scyliorhinus laticeps*, Duméril.

### Carcharhidae.

2. *Galeus australis*, Macleay.

### Squalidae.

3. *Squalus megalops*, Waite.

### Stomiatidae.

4. *Idiacanthus niger*, Regan (Pl. x, fig. 2).

*Idiacanthus niger*, Regan, Ann. Mag. Nat. Hist. (8) xiii, 1914, p. 14.

Depth of body 22 in the length, length of head 13½. Snout longer than diameter of eye, which is 8½ in length of head; interorbital width 5. Barbel twice as long as head. Dorsal 59; origin above posterior part of pelvic fins. Anal 38; origin a little nearer to base of caudal than to that of pelvics, which is equidistant from head and origin of anal. Photophores in ventral series about 37 from isthmus to pelvics, 21 from pelvics to anal. Blackish.

A single specimen, 400 mm. in total length, from the stomach of a "Groper."

Brauer (Valdivia Tiefsee Fische, p. 60) has given a synopsis of the four species of this genus hitherto described, in all of which the origin of the dorsal fin is above or in advance of the base of the pelvics. *I. niger* is nearest to *I. ferox*, Günth., which has a shorter barbel, the dorsal origin above the base of the pelvics, and a longer anal fin commencing at a point nearer to the insertion of the pelvics than to the caudal fin.

The following measurements, in millimetres, are taken from the types of *I. niger* and *I. ferox*:—

| | I. niger. | I. ferox. |
|---|---|---|
| Lower jaw | 28 | 14 |
| Barbel | 58 | 24 |
| Length to base of caudal | 380 | 192 |
| ,, ,, origin of dorsal | 170 | 66 |
| ,, ,, base of pelvics | 150 | 66 |
| ,, from base of pelvics to origin of anal | 120 | 58 |
| ,, ,, origin of anal to base of caudal | 110 | 68 |

### Gonorhynchidae.

5. *Gonorhynchus gonorhynchus*, Linn.

A small example from a rock-pool at Whangaroa.

### Muraenidae.

6. *Muraena nubila*, Richards

### Hemirhamphidae.

7. *Hemirhamphus intermedius*, Cant.

Lyttelton Harbour.

## Exocoetidae.

8. *Exocoetus spilonotopterus*, Bleek.

## Macrorhamphosidae.

### *Notopogon*, Regan.

*Notopogon*, Regan, Ann. Mag. Nat. Hist. (8) xiii, 1914, p. 14.

This genus is distinguished from *Macrorhamphosus* by the deeper form, the dorsal fins continuous at the base, the strong second spine followed by five nearly equidistant and gradually decreasing in length backwards, and by the development of a patch of bristles on the nape in the adult fish. From *Centriscops* it differs in the last character and in having only three well-developed plates in each dorso-lateral series.

9. *Notopogon lillei*, Regan (Pl. xii, fig. 4).

*Centriscops humerosus* (*non* Richards) McCulloch, "Endeavour," Fish. p. 24, fig. 5, and pl. ix (1911).
*Notopogon lillei*, Regan, Ann. Mag. Nat. Hist. (8) xiii, 1914, pp. 14, 20.

Depth of body $2\frac{2}{3}$ in length, length of head 2. Distance from base of dorsal spine to vent $1\frac{2}{5}$ in that from head to caudal fin. Diameter of eye $3\frac{1}{2}$ in length of snout, a little more than postorbital part of head, twice depth of cheek. Interorbital space convex, with blunt median ridge; width $\frac{3}{4}$ diameter of eye. Back slightly, belly more strongly convex. Two series of bony plates on each side of back; only three large plates in each series; ventral plates keeled in front of, spinate behind pelvic fins. Dorsal vii, 14, the two fins continuous; second spine strong, serrated, inserted above middle of anal fin, its length a little more than $\frac{1}{2}$ distance from operculum to caudal fin. Anal 19. Pectoral as long as head without snout. Caudal truncate.

A single specimen, 125 mm. in total length, from New Zealand, caught by fishermen; the species is also known from the south coast of Australia; it is named after Mr. D. G. Lillie.

10. *Notopogon xenosoma*, Regan (Pl. xii, fig. 5).

*Notopogon xenosoma*, Regan, Ann. Mag. Nat. Hist. (8) xiii, 1914, pp. 14, 20.

Body elevated, the distance from base of dorsal spine to vent a little greater than that from head to caudal fin. Head $2\frac{1}{6}$ in the length. Diameter of eye a little longer than postorbital length of head, $\frac{2}{5}$ length of snout, twice depth of cheek. Interorbital space flat, its width $\frac{5}{7}$ diameter of eye. Upper profile with a moderate hump; belly convex. Only three large plates in each dorso-lateral series; last of dorsal series bearing a spine; ventral plates spinate; a pair of spines at posterior end of lower jaw; a patch of scales behind dorsal hump modified into short bristles. Dorsal vii, 15, the two fins subcontinuous; second spine rather slender, serrated, inserted above caudal peduncle, its length $\frac{3}{5}$ distance from operculum to caudal. Anal 17. Pectoral as long as head without snout. Caudal truncate.

A single specimen, 80 mm. in total length, from Cape North; 70 fathoms.

Compared with *N. schoteli* this species is still more aberrant in form, with the insertion of the dorsal spine higher and further back, behind instead of in front of the soft dorsal fin. It agrees more closely with *N. fernandezianus*, which has been figured by Delfin on the cover of his Catalogue of Chilean Fishes. The type of *N. fernandezianus* measures 167 mm., and it may be owing to its larger size that the eye is smaller ($5\frac{1}{2}$ in length of head), the snout longer ($1\frac{3}{5}$ instead of $1\frac{1}{5}$ rest of head) than in *N. xenosoma*; also the greater length of the dorsal bristles is doubtless due to age. The difference in structure and position of the dorsal spine may be more important, and in all probability direct comparison would reveal other differences between the two forms.

### Syngnathidae.

11. *Solenognathus spinosissimus*, Günth.

12. *Stigmatophora macropterygia*, Duméril.
D'Urville Island.

### Trachichthyidae.

13. *Paratrachichthys trailli*, Hutton.
Elmsley Bay, South Island.

### Gempylidae.

14. *Thyrsites atun*, Euphras.

### Trichiuridae.

15. *Lepidopus caudatus*, Euphras.

### Serranidae.

16. *Caprodon longimanus*, Günth.

### *Serranops*, Regan.

*Serranops*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 15.

Related to *Plectranthias*, Bleek, but with the serrations of the lower praeopercular limb weak, not antrorse, and the scales spinulose. Distinguished externally from *Lepidoperca* by the larger mouth, naked maxillary, and almost naked spinous dorsal fin. Skeleton as in *Plectranthias*, the frontals smooth and convex behind the orbits and narrow between them, with the mucous canals in contact and the supraorbital flanges little developed. Vertebrae 10 + 16.

17. *Serranops maculicauda*, Regan (Pl. XI, fig. 3).

*Serranops maculicauda*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 15.

Depth of body $2\frac{2}{3}$ to 3 in the length, length of head $2\frac{1}{2}$ to $2\frac{2}{3}$. Snout shorter than diameter of eye, which is 3 in length of head; interorbital width 6. Upper

surface and sides of head scaly; praeorbital and maxillary naked; lower jaw scaly. Maxillary extending to below middle or posterior part of eye. 16 gill-rakers on lower part of anterior arch. 33 or 34 scales in the lateral line. Dorsal x, 15; middle spines longest, $\frac{1}{3}$ to $\frac{2}{3}$ length of head; second soft ray more or less produced. Anal III 7; second spine longest, longer than highest spines of dorsal fin. Pectoral $\frac{3}{4}$ length of head. Caudal truncate; ray at upper angle sometimes produced. A large dark spot on each side of caudal peduncle, usually another below spinous dorsal.

Eight specimens, 60 to 100 mm. in total length, from seven miles E. of Cape North; depth 70 fathoms; bottom sand.

### *Lepidoperca*, Regan.

*Lepidoperca*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 15.

External characters of *Caesioperca*, except that the interorbital region is flat instead of convex, the caudal fin truncate instead of emarginate, the scales larger and the dorsal and anal rays slightly less numerous. Skeleton differing from that of *Caesioperca* in the absence of a transverse ridge in front of the occipital crest and in having the mucous canals of the frontals separated by a narrow groove, whereas in *Caesioperca* they border a fossa which broadens out anteriorly. Vertebrae 10 + 16.

18. *Lepidoperca inornata*, Regan (Pl. XI, fig. 4).

*Lepidoperca inornata*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 15.

Depth of body $2\frac{1}{2}$ in the length, length of head $2\frac{3}{4}$. Diameter of eye $2\frac{1}{2}$ in the length of head, interorbital width 4. Interorbital space flat; praeorbital scaly; maxillary not quite reaching vertical from middle of eye; 25 gill-rakers on lower part of anterior arch. Dorsal x, 16; fourth spine longest, nearly $\frac{1}{2}$ length of head, $1\frac{1}{2}$ as long as last spine. Anal III 8; second spine a little longer than longest of dorsal. Pectoral slightly shorter than head; ninth ray from above (eighth from below) longest. Caudal truncate. 38 scales in a lateral longitudinal series, 41 in the lateral line. Traces of reddish longitudinal stripes.

A specimen of 135 mm. from near Cape North, 70 fathoms, bottom sand; also a second much smaller example, 60 mm. in total length.

This species is closely related to the recently described *L. coatsii*, Regan (Trans. R. Soc. Edinburgh, XLIX, 1913, p. 237, pl. VI, f. 1), from Gough Island, but is distinguished by the deeper body, fewer scales, scaly praeorbital, shorter maxillary, higher last dorsal spine and immaculate dorsal fin.

## PLESIOPIDAE.

19. *Acanthoclinus littoreus*, Forst.

## CARANGIDAE.

20. *Seriola lalandii*, Cuv. and Val.

CEPOLIDAE.

21. *Cepola aotea*, Waite.

CHILODACTYLIDAE.

22. *Chilodactylus macropterus*, Forst.

PARAPERCIDIDAE.

23. *Parapercis gilliesii*, Hutton.

HEMEROCOETIDAE.

24. *Hemerocoetes pauciradiatus*, Regan (Pl. XII, fig. 1).

*Hemerocoetes pauciradiatus*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 15.

Depth of body about 8 in the length, length of head $3\frac{1}{2}$ to $3\frac{2}{3}$, distance from tip of snout to origin of dorsal fin $3\frac{1}{3}$ to $3\frac{2}{3}$, to origin of anal about $2\frac{1}{2}$. Snout as long as or shorter than diameter of eye, which is $3\frac{1}{3}$ to $3\frac{2}{3}$ in the length of head; interorbital space narrow; maxillary extending to below middle of eye; 13 very short gill-rakers on lower part of anterior arch. About 45 scales in a longitudinal series. Dorsal 36; origin above anterior $\frac{1}{4}$ of pectoral. Anal 32. Pectoral $\frac{2}{3}$ length of head; pelvics reaching vent. Caudal subtruncate. A lateral series of dark spots.

Two specimens, 50 and 62 mm. in total length, from seven miles east of Cape North; depth 70 fathoms; bottom sand.

25. *Hemerocoetes macrophthalmus*, Regan (Pl. XII, fig. 2).

*Hemerocoetes macrophthalmus*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 15.

Depth of body about 10 in the length, length of head $3\frac{3}{4}$ to 4, distance from tip of snout to origin of dorsal fin $3\frac{1}{4}$ to $3\frac{1}{2}$, to origin of anal $2\frac{2}{3}$ to $2\frac{3}{4}$. Snout shorter than diameter of eye, which is $2\frac{2}{3}$ to 3 in length of head; interorbital space very narrow; maxillary extending to below middle of eye; 15 very short gill-rakers on lower part of anterior arch. About 47 scales in a longitudinal series. Dorsal 39; origin above anterior $\frac{1}{3}$ of pectoral. Anal 36. Pectoral $\frac{3}{5}$ length of head; pelvics reaching vent. Caudal truncate; upper rays sometimes produced. A series of dark spots along middle of side, another series on back.

Two specimens, 90 and 120 mm. in total length, from seven miles east of Cape North; depth 70 fathoms; bottom sand.

I propose the new name *Hemerocoetes waitei* for the species described and figured by Waite (Rec. Canterbury Mus. I, 1911, p. 245, pl. LIV, f. 1) as *Hemerocoetes acanthorhynchus*. The dorsal has 42 rays and the anal 40, and these fins originate somewhat further forward than in *H. macrophthalmus*, which it closely resembles in other characters.

The true *H. acanthorhynchus*, Forster, is the species described and figured by Waite (t.c., p. 247, pl. LIV, f. 2) as *H. microps*. The original description, that the

eye is less than $\frac{1}{4}$ of the length of the head in a specimen of 200 mm., leaves no doubt on this point. In examples of this species I count 40 to 42 dorsal and 38 to 40 anal rays.

### Stromateidae.

26. *Centrolophus maoricus*, Ogilb.

Depth of body $3\frac{1}{2}$ in the length; length of head $3\frac{1}{4}$ to $3\frac{1}{2}$. Snout from a little shorter to a little longer than diameter of eye, which is $3\frac{1}{4}$ to $4\frac{1}{3}$ in the length of head and less than interorbital width. Maxillary extending to below anterior $\frac{1}{4}$ or $\frac{1}{3}$ of eye. 14 gill-rakers on lower part of anterior arch. Dorsal 43; origin above base of pectoral. Anal 27. Pectoral $\frac{2}{3}$ length of head; pelvics a little shorter. Caudal emarginate. Caudal peduncle nearly twice as long as deep. 180 scales in a longitudinal series; lateral line curved anteriorly, becoming straight above origin of anal. Purplish; longitudinal series of oblong pale spots more or less distinct on sides of body; two broad dusky bands across the body, one in front of and one above the anal fin.

Three Kings Islands, north of New Zealand; surface.

Here described from two specimens, 150 and 280 mm. in length, which have the body a little deeper and the head a little larger than in young examples of the Atlantic *C. niger*, Gmel.; also the fin-rays are somewhat more numerous and the origin of the dorsal fin is further forward; it is probable that these specimens pertain to *C. maoricus*, Ogilby (Rec. Austral. Mus. II, 1893, p. 64), described from a larger fish.

Since my revision of the genus *Centrolophus* (Ann. Mag. Nat. Hist. (7) X, 1902, p. 194) Waite* has described a new species, *C. huttoni*, from New Zealand, well distinguished by the large number of fin-rays. *C. britannicus* has been rediscovered,† and I have examined the type of the Californian *Icichthys lockingtoni*, Jord. and Gilb., in the Smithsonian Institution; this is a *Centrolophus*, very similar to *C. niger*.

27. *Cubiceps caeruleus*, Regan.

*Cubiceps caeruleus*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 15.

Depth of body nearly equal to length of head, $3\frac{2}{5}$ to $3\frac{3}{5}$ in length of fish. Snout as long as or a little shorter than diameter of eye, which is $3\frac{1}{2}$ to $3\frac{2}{3}$ in length of head and a little less than interorbital width. Maxillary not quite reaching vertical from anterior margin of eye; praeorbital narrowed posteriorly, not completely concealing maxillary. 14 or 15 gill-rakers on lower part of anterior arch. Dorsal XI, I 23. Anal III 21. Pectoral as long as head, extending to origin of anal. Caudal forked. Probably not more than 50 scales in a longitudinal series. Bluish.

Three Kings Islands.

Two specimens, 100 and 110 mm. in length, from the stomach of a *Seriolella*.

* Trans. N. Z. Inst. XLII, 1910, p. 388.

† Pellegrin, Bull. soc. zool., XXXVII, 1912, p. 20.

In the Atlantic *C. gracilis*, Lowe, the body is less deep, the snout shorter, and the eye larger; also the maxillary is completely hidden, and the pectoral fin extends beyond the origin of the anal. Owing to the imperfect condition of the types of *C. caeruleus* the number of scales cannot be certainly stated, but they seem to be larger than in *C. gracilis*, which has 58 to 66 in a longitudinal series.

Since my revision of the genus *Cubiceps* (Ann. Mag. Nat. Hist. (7) x, 1902, p. 122), when four species were recognised, Jordan and Snyder have described a species from Honolulu under the name *Ariomma lurida*. This is figured by Jordan and Evermann (Bull. U. S. Fish. Comm. XXIII, 1905 p. 217, pl. XXXVII), and is evidently closely related to *Cubiceps pauciradiatus*, Günth. and *C. brevimanus*, Klunz.

## Brotulidae.

### *Pyramodon*, Radcliffe.

*Pyramodon*, Radcliffe, Proc. U.S. Nat. Mus. XLIV, 1913, p. 175.
*Cynophidium*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 16

Head and body naked, compressed; tail tapering; no lateral line. Head unarmed, without large muciferous channels, smooth and convex above; eyes well-developed; no barbels. Mouth large, protractile, terminal, with the lower jaw included; teeth subconical, in a narrow band in praemaxillaries, uniserial and unequal in lower jaw and on palatines; upper jaw with a rather wide toothless interspace between a pair of canines, which are outside the mouth when it is closed; lower jaw with a pair of strong recurved anterior canines; vomer with a very strong curved canine followed by a few smaller teeth. Gill-membranes separate, free; 7 branchiostegals; 4 gills; pseudobranchiae very small. Vent and origins of dorsal and anal fins a short distance behind head; vertical fins confluent at end of tail; no distinct caudal fin; pectorals well-developed; pelvics jugular, a pair of simple filaments.

This genus differs from *Snyderidia*, Gilbert, 1905 (Bull. U. S. Fish. Comm. 1903, p. 654), in the presence of pelvic fins. In many respects these two genera seem to connect the Brotulidae with the Fierasferidae, but I have ascertained that *Pyramodon* agrees with the Brotulidae in the structure of the upper surface of the skull, the supraoccipital separating the rather small parietals.

28. *Pyramodon punctatus*, Regan (Pl. XII, fig. 3).

*Cynophidium punctatum*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 16.

Depth of body nearly equal to length of head, which is 6 in the length of the fish; distance from end of snout to origin of dorsal fin $4\frac{3}{4}$. Snout, diameter of eye and interorbital width subequal, about $\frac{1}{5}$ the length of head. Maxillary extending beyond eye. Three gill-rakers and several rudiments on lower part of anterior arch. Origin of dorsal fin slightly in advance of vent; pectoral $\frac{4}{5}$ length of head; pelvics $\frac{1}{3}$ length of head, or $\frac{1}{2}$ distance from their base to origin of anal. Olivaceous, powdered with little dark spots.

A single specimen, 185 mm. in total length, from seven miles east of Cape North; depth 70 fathoms; bottom sand.

The other known species, *P. centralis*, Radcliffe, was described from a specimen taken near Doworra Island, Dutch E. Indies, at a depth of 205 fathoms.

SCORPAENIDAE.

29. *Sebastes percoides*, Richards.

30. *Scorpaena cardinalis*, Richards.

TRIGLIDAE.

31. *Trigla kumu*, Less. and Garn.

BOTHIDAE.

32. *Pseudorhombus boops*, Hect.

33. *Arnoglossus mongonuiensis*, Regan (Pl. XI, fig. 2).

*Arnoglossus mongonuiensis*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 16.

Depth of body $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length, length of head 4 to $4\frac{1}{2}$. Diameter of eye 3 to $3\frac{1}{2}$ in length of head; lower eye a little in advance of upper; interorbital space narrow. Maxillary extending to below anterior edge of eye; males with a blunt spine on snout and a prominent knob below symphysis of lower jaw. Six or seven gill-rakers on lower part of anterior arch. About 70 scales in a longitudinal series. Dorsal 86–90; second to fifth rays prolonged in males. Anal 72–76. Pectoral of eyed side $\frac{2}{3}$ to $\frac{3}{4}$ (♂) or $\frac{3}{5}$ (♀) of the length of head, of blind side about $\frac{2}{3}$ (♂) or less (♀). Caudal rounded or obtusely pointed. Olivaceous, with darker spots.

Four examples, 75 to 85 mm. in total length, from off Cape North; depth 14 to 30 fathoms; bottom sandy.

GOBIESOCIDAE.

34. *Crepidogaster simus*, Hutton.

## 3.—FISHES FROM BRAZIL.

These were taken off Cape Frio, in 22° 56′ S., 41° 34′ W., at a depth of 40 fathoms.

RAIIDAE.

1. *Psammobatis cirrifer*, Regan (Pl. XIII).

*Malacorhina cirrifer*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 16.

Disc about as broad as long (to posterior end of pelvic fins), terminating in a barbel borne by a small triangular prominence; anterior margins of disc slightly undulated, outer angles rounded. Vent nearer to tip of snout than to end of tail.

Snout twice as long as longitudinal diameter of eye with spiracle; interorbital width equal to transverse diameter of eye. Internasal width less than $\frac{1}{2}$ praeoral length of snout, less than distance of either nostral from edge of disc. Teeth obtuse, close-set; about 40 series in upper jaw, which has a median emargination. Disc smooth below, above with scattered spines with radiating bases, set more closely near the anterior and posterior margins; a series of spines at inner margin of each orbit; a triangular patch on scapulary region; tail with three series posteriorly, five anteriorly, continued forward on the disc as two only; two spines between the well-separated dorsal fins. Brownish, with scattered darker and paler spots.

A single specimen, a young female, 220 mm. in total length. In the spination and in the separation of the dorsal fins this species is nearer to the Chilean one described by Garman from an adult male as *Malacorhina mirus* than to *Psammobatis rudis*, Günth. *Malacorhina* seems to be a synonym of *Psammobatis*, and the adult male of *Ps. cirrifer* may have the anterior margins of the disc notched as in *Ps. mirus*; similar differences in form due to sex and age are known in *Raia fyllae*, Lütken.

### Muraenidae.

2. *Muraena ocellata*, Agass.

### Congridae.

3. *Congromuraena balearica*, Delaroche.

### Synodontidae.

4. *Trachinocephalus myops*, Forst.

### Syngnathidae.

5. *Hippocampus punctulatus*, Guichen.

### Serranidae.

6. *Serranus auriga*, Cuv. and Val.

### Triglidae.

7. *Prionotus brachychir*, Regan (Pl. xi, fig. 1).

*Prionotus brachychir*, Regan, Ann, Mag. Nat. Hist. (8) xiii, 1914, p. 16.

Depth of body about $3\frac{1}{2}$ in the length, length of head (without opercular spine) $2\frac{3}{5}$ to 3. Diameter of eye nearly equal to length of snout or postorbital part of head; interobital space a little concave, its width $\frac{2}{3}$ diameter of eye. Maxillary extending to below anterior $\frac{1}{4}$ of eye. Opercular and praeopercular spines strong; no other spines on head; a short cleithral spine; 10 gill-rakers on lower part of anterior arch. 50 to 60 scales in a lateral series, 45 to 50 in lateral line; chest naked. Dorsal viii–xi.

10–12; second or third spine longest, nearly $\frac{1}{2}$ length of head. Anal 10–12. Pectoral shorter than head, extending to origin of anal or slightly beyond. Caudal emarginate. A blackish spot near edge of spinous dorsal, between fourth and sixth spines; soft dorsal with series of small dark spots; caudal with three dark cross-bars; pectoral blackish.

Several specimens, 70 to 80 mm. in total length.

8. *Prionotus tribulus*, Cuv.

OPHIDIIDAE.

9. *Ophidium brevibarbe*, Cuv.

BOTHIDAE.

10. *Etropus microstomus*, Gill.

11. *Paralichthys oblongus*, Mitch.

12. *Xystreurys brasiliensis*, Regan (Pl. x, fig. 1).

*Xystreurys brasiliensis*, Regan, Ann. Mag. Nat. Hist. (8) XIII, 1914, p. 17.

Depth of body $2\frac{1}{3}$ in the length, length of head 4. Snout $\frac{3}{5}$ diameter of eye, which is 3 in length of head. Eyes separated by a narrow ridge. Maxillary extending a little beyond anterior $\frac{1}{3}$ of eye; lower jaw $\frac{1}{2}$ length of head. Gill-rakers moderately elongate, 10 on lower part of anterior arch. 85 scales in a longitudinal series. Dorsal 83. Anal 66. Left pectoral nearly as long as head, right scarcely more than $\frac{1}{2}$ length of head. Caudal pointed. A large double ocellus at end of arch of lateral line; a small ocellus between it and dorsal fin; a large dark spot posteriorly on lateral line.

A single specimen, 170 mm. in total length.

The only other known species of this genus is *X. liolepis*, Jord. and Gilb., from the coast of southern California.

CYNOGLOSSIDAE.

13. *Symphurus plagiusa*, Linn.

BATRACHOIDIDAE.

14. *Porichthys porosissimus*, Cuv. and Val.

LOPHIIDAE.

15. *Lophius piscatorius*, Linn.

# II.—GENERAL PART.

## 1. THE DISTRIBUTION OF ANTARCTIC AND SUBANTARCTIC FISHES.

### A. COAST FISHES.

It is convenient to distinguish between coast fishes and oceanic fishes, including in the former not only the littoral forms but also fishes that may occur at no great distance

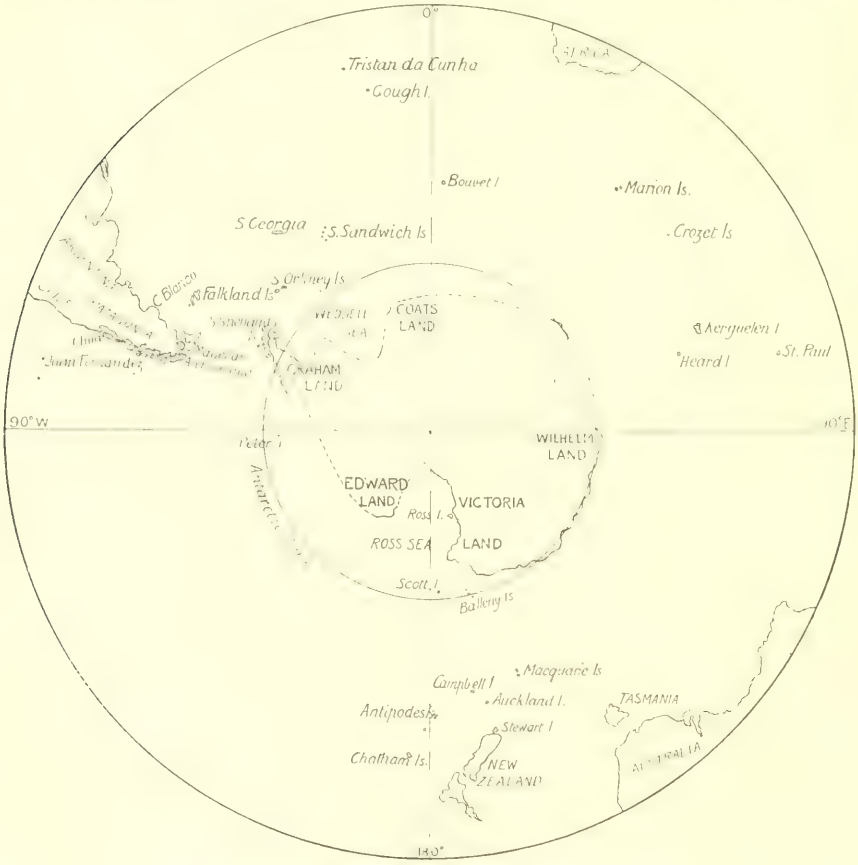


Fig. 1. Map showing the principal localities mentioned in the text.

from the coasts in water down to two or three hundred fathoms deep, and are not pelagic or bathypelagic.

For the first time our knowledge of the fishes of the coasts of the Antarctic continent is sufficiently advanced to make it worth while to attempt to delimit an antarctic zone, and to divide it into districts.

For the purposes of reference it may be stated at once that the conclusions I have

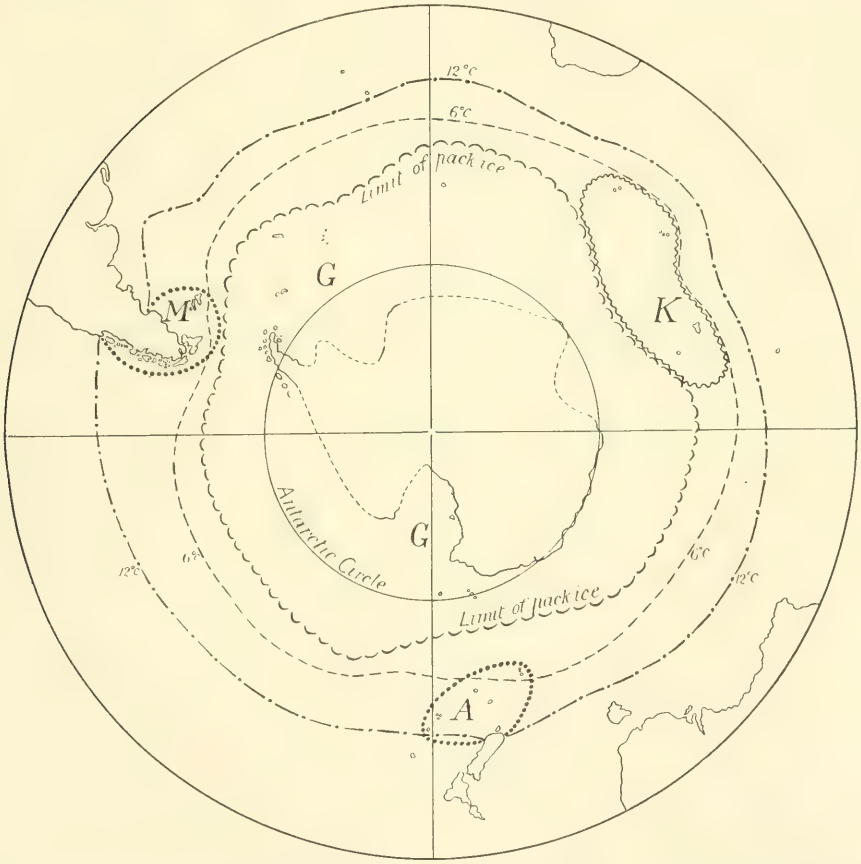


Fig. 2.—Map showing the mean annual surface isotherms of 6° C. — — — — — and 12° C. ·—·—·—·, as calculated by Dr. Schott, respectively approximating to the northern boundaries of the Antarctic and Subantarctic Zones; the extreme limit of pack-ice ⌒⌒⌒ bounding the Glacial District (G); and the Kerguelen (K), Magellan (M) and Antipodes (A) Districts.

reached are that south of the tropical zone the distribution of coast fishes is best illustrated by the following classification:—

1. **South Temperate Zone,** with seven districts: Chile, Argentina, Tristan da Cunha, Cape, St. Paul, Australia, and New Zealand.

2. **Subantarctic Zone,** with two districts: Magellan and Antipodes.

3. **Antarctic Zone,** with two districts: Glacial and Kerguelen.

About 90 per cent. of the species of fishes known from the coasts of the Antarctic continent belong to the division Nototheniiformes; therefore it is evident that the delimitation of an Antarctic region or zone, so far as the fishes are concerned, must be based on the distribution of this group. Recognising this when working out the Antarctic fishes of the "Scotia" expedition about two years ago, I took the opportunity of monographing the Nototheniiformes. Since then Professor Roule's report on the fishes of the second Charcot Expedition has appeared, adding to our knowledge of the species and their distribution. Of the 25 Antarctic species of the "Terra Nova" collection 22 are Nototheniiformes, half of these being new species, and several others new records for Victoria Land. This being so, the list of the species and their distribution given below, whilst agreeing in the main with my monograph, includes several additions and alterations. The South Temperate localities are given first, the subantarctic next, and the strictly Antarctic last. "Magellan" includes the coast northwards to Chiloe and Cape Blanco, and "Antipodes" includes the extreme south of New Zealand and the neighbouring subantarctic islands.

DISTRIBUTION OF THE NOTOTHENIIFORM FISHES.

| | S. Temperate Zone. | | | | | Subantarctic Zone. | | | Antarctic Zone. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chile. | Argentina. | Tristan da Cunha. | St. Paul. | S.E. Australia. | New Zealand. | Antipodes. | Magellan. | Falklands. | Marion Island. | Kerguelen. | South Georgia. | South Orkneys. | Graham Land. | Victoria Land. | Wilhelm Land. | Coats Land. | |
| Bovichthyidae. | | | | | | | | | | | | | | | | | | |
| **Pseudaphritis,** *Casteln.* | | | | | | | | | | | | | | | | | | |
| urvillii, *Cuv. & Val.* | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | A fresh-water fish. |
| **Cottoperca,** *Steind.* | | | | | | | | | | | | | | | | | | |
| gobio, *Günth.* | . | . | . | . | . | . | . | + | + | . | . | . | . | . | . | . | . | |
| macrophthalma, *Regan* | . | . | . | . | . | . | . | + | + | . | . | . | . | . | . | . | . | |
| macrocephala, *Roule* | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | |
| **Bovichthys,** *Cuv. & Val.* | | | | | | | | | | | | | | | | | | |
| variegatus, *Richards.* | . | . | . | . | . | + | + | + | . | . | . | . | . | . | . | . | . | |
| angustifrons, *Regan* | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | |
| diacanthus, *Carmich.* | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| chilensis, *Regan* | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | *B. patagonicus* may be the same as *B. chilensis*, which may range southward to Magellan. |
| patagonicus, *Berg* | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| veneris, *Sauvage* | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | |
| decipiens, *Regan* | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | |
| psychrolutes, *Günth.* | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | |
| roseopictus, *Hutton* | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | |

| | S. Temperate Zone. | | | | | | Subantarctic Zone. | | | Antarctic Zone. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chile. | Argentina. | Tristan da Cunha. | St. Paul. | S.E. Australia. | New Zealand. | Antipodes. | Magellan. | Falklands. | Marion Island. | Kerguelen. | South Georgia. | South Orkneys. | Graham Land. | Victoria Land. | Wilhelm Land. | Coats Land. | |
| Notothenidae. | | | | | | | | | | | | | | | | | | |
| **Trematomus,** *Bouleng.* | | | | | | | | | | | | | | | | | | |
| newnesii, *Bouleng.* | | | | | | | | | | | | | | + | + | | | |
| nicolai, *Bouleng.* | | | | | | | | | | | | | | | + | | | |
| borchgrevinkii, *Bouleng.* | | | | | | | | | | | | | + | + | + | + | | |
| brachysoma, *Pappenh.* | | | | | | | | | | | | | | | + | + | | |
| bernacchii, *Bouleng.* | | | | | | | | | | | | | + | + | + | | | |
| vicarius, *Lönnb.* | | | | | | | | | | | | + | | | | | | |
| dubius, *Lönnb.* | | | | | | | | | | | | + | | | | | | |
| hansoni, *Bouleng.* | | | | | | | | | | | | + | | + | + | + | + | |
| loennbergii, *Regan* | | | | | | | | | | | | | | + | + | | | |
| pennellii, *Regan* | | | | | | | | | | | | | | | + | | | |
| centronotus, *Regan* | | | | | | | | | | | | | | | + | | | |
| scotti, *Bouleng.* | | | | | | | | | | | | | | + | + | | | |
| lepidorhinus, *Pappenh.* | | | | | | | | | | | | | | | + | + | | |
| eulepidotus, *Regan* | | | | | | | | | | | | | | | + | | | |
| **Pleuragramma,** *Bouleng* | | | | | | | | | | | | | | | | | | |
| antarcticum, *Bouleng.* | | | | | | | | | | | | | | + | + | + | | |
| **Notothenia,** *Richards.* | | | | | | | | | | | | | | | | | | |
| trigramma, *Regan* | | | | | | | | | + | | | | | | | | | |
| canina, *Smitt* | | | | | | | | + | | | | | | | | | | |
| ramsayi, *Regan* | | | | | | | | + | + | | | | | | | | | |
| tessellata, *Richards.* | | | | | | | | + | + | | | | | | | | | |
| wiltoni, *Regan* | | | | | | | | + | + | | | | | | | | | |
| brevicauda, *Lönnb.* | | | | | | | | + | + | | | | | | | | | |
| longipes, *Steind.* | | | | | | | | + | | | | | | | | | | |
| sima, *Richards.* | | | | | | | | + | + | | | | | | | | | |
| squamifrons, *Günth.* | | | | | | | | | | | + | | | | | | | |
| larseni, *Lönnb.* | | | | | | | | | | | | + | | + | | | | |
| gibberifrons, *Lönnb.* | | | | | | | | | | | | + | + | + | | | | |
| acuta, *Günth.* | | | | | | | | | | | + | | | | | | | |
| vaillanti, *Regan* | | | | | | | | | | | | | | + | | | | |
| mizops, *Günth.* | | | | | | | | | | | + | | | | | | | |
| nudifrons, *Lönnb.* | | | | | | | | | | | | + | + | + | | | | |
| marionensis, *Günth.* | | | | | | | | | | + | | | | | | | | |
| angustifrons, *Fisch.* | | | | | | | | | | | | + | | | | | | |
| elegans, *Günth.* | | | | | | | | + | | | | | | | | | | |
| cornucola, *Richards.* | | | | | | + | + | + | + | | | | | | | | | Northward to Milford Sound and Chatham Island. |
| cyaneobrancha, *Richards* | | | | | | | | | | | + | | | | | | | |
| coriiceps, *Richards.* | | | | | | | | | | | + | + | + | + | + | | | |
| rossii, *Richards.* | | | | | | | | | | | | + | + | | | | | |
| macrocephala, *Günth.* | + | | | | | + | + | + | + | | | | | | | | | Northward to Concepcion and Lyttelton. |
| microlepidota, *Hutton* | | | | | | | | + | | | | | | | | | | |
| colbecki, *Bouleng.* | | | | | | | | + | | | | | | | | | | |
| filholi, *Sauvage.* | | | | | | | | + | | | | | | | | | | |
| **Dissostichus,** *Smitt* | | | | | | | | | | | | | | | | | | |
| eleginoides, *Smitt* | | | | | | | | + | | | | | | | + | | | |
| **Eleginops,** *Gill* | | | | | | | | | | | | | | | | | | |
| maclovinus, *Cuv. & Val.* | + | + | | | | | | + | + | | | | | | | | | Ranges to northern Chile and the La Plata. |
| **Artedidraco,** *Lönnb.* | | | | | | | | | | | | | | | | | | |
| orianae, *Regan* | | | | | | | | | | | | | | | + | | | |
| mirus, *Lönnb.* | | | | | | | | | | | | | + | | | | | |

| | S. Temperate Zone. | | | | | Subantarctic Zone. | Antarctic Zone. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chile. | Argentina. | Tristan da Cunha. | St. Paul. | S.E. Australia. | New Zealand. | Antipodes. | Magellan. | Falklands. | Marion Island. | Kerguelen. | South Georgia. | South Orkneys. | Graham Land. | Victoria Land. | Wilhelm Land. | Coats Land. | |
| **Artedidraco**—*cont.* | | | | | | | | | | | | | | | | | | |
| skottsbergii, *Lönnb.* | | | | | | | | | | | | | | + | + | | | |
| shackletoni, *Waite* | | | | | | | | | | | | | | | + | | | |
| loennbergii, *Roule* | | | | | | | | | | | | | + | + | + | | | |
| **Dolloidraco**, *Roule* | | | | | | | | | | | | | | | | | | |
| longidorsalis, *Roule* | | | | | | | | | | | | | | + | | | | |
| **Histiodraco**, *Regan* | | | | | | | | | | | | | | | | | | |
| velifer, *Regan* | | | | | | | | | | | | | | | + | | | |
| **Pogonophryne**, *Regan* | | | | | | | | | | | | | | | | | | |
| scotti, *Regan* | | | | | | | | | | | | | | | + | | | |
| **Harpagifer**, *Richards.* | | | | | | | | | | | | | | | | | | |
| bispinis, *Forst.* | | | | | | | | + | + | + | + | + | + | + | | | | |
| Bathydraconidae. | | | | | | | | | | | | | | | | | | |
| **Bathydraco**, *Günth.* | | | | | | | | | | | | | | | | | | |
| antarcticus, *Günth.* | | | | | | | | | | | | | | | | + | | S.E. of Heard Isd. 1,260 fathoms. |
| macrolepis, *Boulenq.* | | | | | | | | | | | | | | | + | | | S.W. of Balleny Is. 252 fathoms. |
| scotiae, *Dollo* | | | | | | | | | | | | | | | | | + | Off Coats Land, 1,410 fathoms. |
| **Gerlachea**, *Dollo* | | | | | | | | | | | | | | | | | | |
| australis, *Dollo* | | | | | | | | | | | | | | + | | | | |
| **Racovitzaia**, *Dollo* | | | | | | | | | | | | | | | | | | |
| glacialis, *Dollo* | | | | | | | | | | | | | | + | | | | |
| **Prionodraco**, *Regan* | | | | | | | | | | | | | | | | | | |
| evansii, *Regan* | | | | | | | | | | | | | | | + | | | |
| **Parachaenichthys**, *Boulenq.* | | | | | | | | | | | | | | | | | | |
| georgianus, *Fisch.* | | | | | | | | | | | | | + | + | | | | |
| **Gymnodraco**, *Boulenq.* | | | | | | | | | | | | | | | | | | |
| acuticeps, *Boulenq.* | | | | | | | | | | | | | | | + | + | | |
| Chaenichthyidae. | | | | | | | | | | | | | | | | | | |
| **Champsocephalus**, *Gill* | | | | | | | | | | | | | | | | | | |
| esox, *Günth.* | | | | | | | | + | | | | | | | | | | |
| gunnari, *Lönnb.* | | | | | | | | | | | | + | | | | | | |
| **Pagetopsis**, *Regan* | | | | | | | | | | | | | | | | | | |
| macropterus, *Boulenq.* | | | | | | | | | | | | | | + | + | + | | |
| **Chaenichthys**, *Richards.* | | | | | | | | | | | | | | | | | | |
| rhinoceratus, *Richards.* | | | | | | | | | | | + | | | | | | | |
| rugosus, *Regan* | | | | | | | | | | | + | | | | | | | |
| **Chaenocephalus**, *Regan* | | | | | | | | | | | | | | | | | | |
| aceratus, *Lönnb.* | | | | | | | | | | | | | + | | | | | |
| **Cryodraco**, *Dollo* | | | | | | | | | | | | | | | | | | |
| antarcticus, *Dollo* | | | | | | | | | | | | | | + | | | | |
| atkinsoni, *Regan* | | | | | | | | | | | | | | | + | | | |
| pappenheimi, *Regan* | | | | | | | | | | | | | | | | + | | |
| **Chionodraco**, *Lönnb.* | | | | | | | | | | | | | | | | | | |
| hamatus, *Lönnb.* | | | | | | | | | | | | | | + | | | | |
| kathleenae, *Regan* | | | | | | | | | | | | | | | + | | | |
| **Chaenodraco**, *Regan* | | | | | | | | | | | | | | | | | | |
| wilsoni, *Regan* | | | | | | | | | | | | | | | + | | | |
| fasciatus, *Regan* | | | | | | | | | | | | | | | + | | | |

The supposed relationships of the Nototheniiform families and of the genera of the Bovichthyidae are shown by the following diagram :—

Chaenichthyidae Bathydraconidae

Nototheniidae

Bovichthys

Cottoperca

Pseudaphritis

Bovichthyidae.

In summarising the distribution of the Nototheniiformes the Bovichthyidae, the most generalised family, may be considered first. *Pseudaphritis* most nearly represents the prototype of the whole group and is the only genus peculiar to the South Temperate Zone ; but the single species also differs from other fishes of the family in that it is chiefly, or perhaps entirely, fluviatile. It may perhaps be regarded as a relict form, analogous to the *Galaxias* of New Caledonia, dating from a time when the seas of Australia were colder. The related *Cottoperca* is marine and is confined to the Magellan District, whilst *Bovichthys*, which seems to be *Cottoperca* specialised, is principally South Temperate, but is Subantarctic also in the Antipodes District.

The remaining families include 22 genera ; one (*Eleginops*) is monotypic and occurs in the Magellan, Chilean and Argentine Districts ; the rest are Antarctic, 16 peculiar to the Glacial District, one peculiar to the Kerguelen District, and four found also in the Subantarctic Zone. Of these last, two (*Dissostichus, Harpagifer*) are monotypic, the third (*Champsocephalus*) has only two species, and the fourth is the large genus *Notothenia*, well represented in both Antarctic and Subantarctic Zones. The species of *Notothenia* form five natural groups :—

(1) the *tessellata* group, comprising the first eight species in the list and confined to the Magellan District ; these have the interorbital region rather broad, the upper surface of the head except the snout, and its sides except the praeorbital fully scaled.

(2) the *squamifrons* group, including only *N. squamifrons* from Kerguelen and *N. larseni* from Graham Land and South Georgia ; distinguished from the preceding by the narrow interorbital region and the scaly snout and praeorbital.

(3) the *acuta* group, including the next five species, all belonging to the Antarctic

Zone. These have the interorbital region narrow, but resemble the *tessellata* group in the scaling of the head.

(4) the *marionensis* group, differing from the last in that the cheeks and opercles are scaly above, naked below. This includes only *N. marionensis*, from Marion Island, and *N. angustifrons*, from South Georgia.

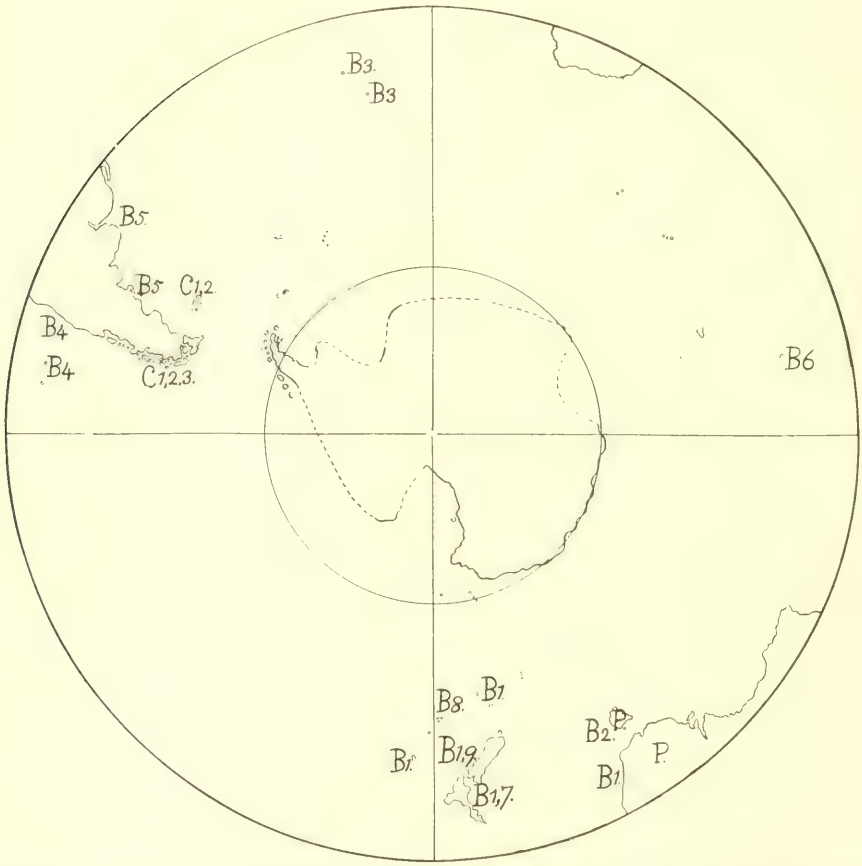


FIG. 3.—Distribution of Bovichthyidae: P. *Pseudaphritis urvillii*; C 1, *Cottoperca gobio*; C 2, *C. macrophthalma*; C 3, *C. macrocephala*; B 1, *Bovichthys variegatus*; B 2, *B. angustifrons*; B 3, *B. diacanthus*; B 4, *B. chilensis*; B 5, *B. patagonicus*; B 6, *B. veneris*; B 7, *B. decipiens*; B 8, *B. psychrolutes*; B 9, *B. roscopictus*.

(5) the *coriiceps* group, with the upper surface of the head naked and the opercles scaled only on the upper part of the operculum. This includes the last eight species and is the only group found in both zones.

Next to the Nototheniiformes the Zoarcidae are of importance. This is principally a northern family and includes both oceanic and coast fishes, many of the latter frequenting rather deep water. South of the tropics the Zoarcidae are represented by

Fig. 4.—Distribution of *Trematomus* and *Notothenia*: 1, *T. newnesii*; 2, *T. nicolai*; 3, *T. borchgrevinkii*; 4, *T. brachysoma*; 5, *T. bernacchii*; 6, *T. vicarius*; 7, *T. dubius*; 8, *T. hansoni*; 9, *T. loennbergii*; 10, *T. pennellii*; 11, *T. centronotus*; 12, *T. scotti*; 13, *T. lepidorhinus*; 14, *T. eulepidotus*. a, *N. trigramma*; b, *N. canina*; c, *N. ramsayi*; d, *N. tessellata*; e, *N. wiltoni*; f, *N. brevicauda*; g, *N. longipes*; h, *N. sima*; i, *N. squamifrons*; j, *N. larseni*; k, *N. gibberifrons*; l, *N. acuta*; m, *N. vaillanti*; n, *N. mizops*; o, *N. nudifrons*; p, *N. marionensis*; q, *N. angustifrons*; r, *N. elegans*; s, *N. cornucola*; t, *N. cyaneobrancha*; u, *N. coriiceps*; v, *N. rossii*; w, *N. macrocephala*; x, *N. microlepidota*; y, *N. colbecki*; z, *N. filholi*.

a number of genera from the coasts of America and Antarctica. The following list is based on my revision in the "Scotia" report, modified by the study of a paper by

Prof. Lahille* that I had overlooked, as it had been omitted from the Zoological Record.

DISTRIBUTION OF THE SOUTHERN ZOARCIDAE.

| | S. Temperate Zone. | | | | | Subantarctic Zone. | | | Antarctic Zone. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chile. | Argentina. | Tristan da Cunha. | St. Paul. | S.E. Australia. | New Zealand. | Antipodes. | Magellan. | Falklands. | Marion Island. | Kerguelen. | South Georgia. | South Orkneys. | Graham Land. | Victoria Land. | Wilhelm Land. | Coats Land. | |
| **Lycenchelys,** *Gill* | | | | | | | | | | | | | | | | | | |
| antarcticus, *Regan* | | | | | | | | | | | | | + | | | | | 62° 10′ S., 41° 20′ W., 1,775 fathoms; other species from deep water N. of the equator. |
| **Ophthalmolycus,** *Regan* | | | | | | | | | | | | | | | | | | |
| macrops, *Günth.* | | | | | | | | | + | | | | | | | | | |
| concolor, *Roule* | | | | | | | | | | | | | | + | | | | |
| **Caneolepis,** *Lahille* | | | | | | | | | | | | | | | | | | |
| acropterus, *Lahille* | | + | | | | | | | | | | | | | | | | |
| **Iluocoetes,** *Jenyns* | | | | | | | | | | | | | | | | | | |
| fimbriatus, *Jenyns* | | | | | | | | | + | + | | | | | | | | |
| elongatus, *Smitt* | | | | | | | | | + | | | | | | | | | |
| **Lycodichthys,** *Pappenh.* | | | | | | | | | | | | | | | | | | |
| antarcticus, *Pappenh.* | | | | | | | | | | | | | | | | + | | |
| **Austrolycichthys,** *Regan* | | | | | | | | | | | | | | | | | | |
| brachycephalus, *Papph.* | | | | | | | | | | | | | | | | + | | |
| bothriocephalus, *Papph.* | | | | | | | | | | | | | | | | + | | |
| **Austrolycus,** *Regan* | | | | | | | | | | | | | | | | | | |
| morenoi, *Lahille* | | + | | | | | | | | | | | | | | | | |
| depressiceps, *Regan* | | | | | | | | | + | + | | | | | | | | |
| platei, *Steind.* | | | | | | | | | + | | | | | | | | | |
| **Phucocoetes,** *Jenyns* | | | | | | | | | | | | | | | | | | |
| latitans, *Jenyns* | | | | | | | | | | + | | | | | | | | |
| **Crossostomus,** *Lahille* | | | | | | | | | | | | | | | | | | |
| fimbriatus, *Lahille* | | | | | | | | | + | | | | | | | | | |
| fasciatus, *Lönnb.* | | | | | | | | | | + | | | | | | | | |
| **Platea,** *Steind.* | | | | | | | | | | | | | | | | | | |
| insignis, *Steind.* | | | | | | | | | + | | | | | | | | | |
| **Maynea,** *Cunningh.* | | | | | | | | | | | | | | | | | | |
| patagonica, *Cunningh.* | | | | | | | | | + | + | | | | | | | | |
| antarctica, *Fisch.* | | | | | | | | | | | | | + | | | | | |
| **Melanostigma,** *Günth.* | | | | | | | | | | | | | | | | | | |
| gelatinosum, *Günth.* | | | | | | | | | + | | | | | | | | | Magellan Straits, 24 fathoms; other species from deep water of N. Atlantic and Pacific. |

Two species are the southern representatives of the northern deep-water genera *Lycenchelys* and *Melanostigma*. The rest are all generically distinct from the northern

* Lahille, "Nota sobre los Zoarcidos Argentinos," An. Mus. Nac. Buenos Aires XVI, 1908, pp. 403–441. The net result of this paper is to add *Austrolycus morenoi* and *Caneolepis acropterus* and to replace *Crossolycus* by *Crossostomus*, unless the latter is regarded as preoccupied by *Crossostoma*. *Lycodalepis laticinctus* is probably a synonym of *Austrolycus platei*.

members of the family; two genera are peculiar to the Antarctic, two common to the Antarctic and Magellan, four peculiar to the Magellan District, one common to Magellan and Argentina, and one peculiar to the last-named.

The Magellan District is the headquarters of the southern Zoarcidae, which may have reached it originally from the north along the American coast, perhaps migrating in rather deep and cold water. It is of interest to note that no Zoarcidae are known from the South Temperate and Subantarctic Zones outside the Argentine and Magellan Districts. Evidently the southern coast fishes of this family have been able to extend their range only along a nearly continuous shore line; this is in harmony with what is known as to their breeding and development.

## THE ANTARCTIC ZONE.

This includes the coasts of the Antarctic continent and the islands that lie to the south of the isotherm of 6° C., with the probable exception of Macquarie Island.

It is characterised by the complete absence of South Temperate types, by the absence of Bovichthyidae and the great development of the other Nototheniiformes. It is more sharply marked off than any other zone, the percentage of peculiar genera being extremely high and that of species that range beyond its limits very low.

### Glacial District.

This includes the coasts of the Antarctic continent and neighbouring islands, together with South Georgia, the South Sandwich Islands, and probably Bouvet Island, all lying within the extreme limit of pack-ice. About 90 per cent. of the coast fishes of this district are Nototheniiformes and most of the rest are Zoarcidae.

Nototheniidae. The Nototheniinae are represented by *Trematomus* (14 spp.), *Pleuragramma* (1 sp.), *Notothenia* (6 spp.), and *Dissostichus* (1 sp.). *Eleginops* is absent. The two first-named genera are confined to this area; five of the six species of *Notothenia* are peculiar, the exception being *N. coriiceps*, which ranges to Kerguelen. *Dissostichus eleginoides* is common to Graham Land and Magellan.

The Harpagiferinae (*Artediidraco*, *Dolloidraco*, *Histiodraco*, *Pogonophryne*, *Harpagifer*) are confined to this district, with the exception of *Harpagifer bispinis*, which extends also to the Kerguelen and Magellan Districts.

Bathydraconidae are confined to the district. *Bathydraco* must be regarded as oceanic, and probably the related genera *Gerlachea*, *Racovitzaia* and *Prionodraco* should go with it; but none of these has been found far from the coast of Antarctica, the most northerly being *B. antarcticus*, taken midway between Wilhelm Land and Heard Island. *Parachaenichthys georgianus* from South Georgia and *Gymnodraco acuticeps* from the coasts of the Antarctic continent may be reckoned as coast fishes.

Chaenichthyidae are characteristic, the only extralimital forms being the two species of *Chaenichthys* (Kerguelen) and *Champsocephalus esox* (Magellan).

ZOARCIDAE are represented by a species of *Maynea* from South Georgia, the only other species of the genus inhabiting the Magellan District, and by three species from the coasts of Antarctica, belonging to two endemic genera, *Lycodichthys* and *Austrolycichthys*, related to the Magellan *Unocoetes* and *Austrolycus* respectively.

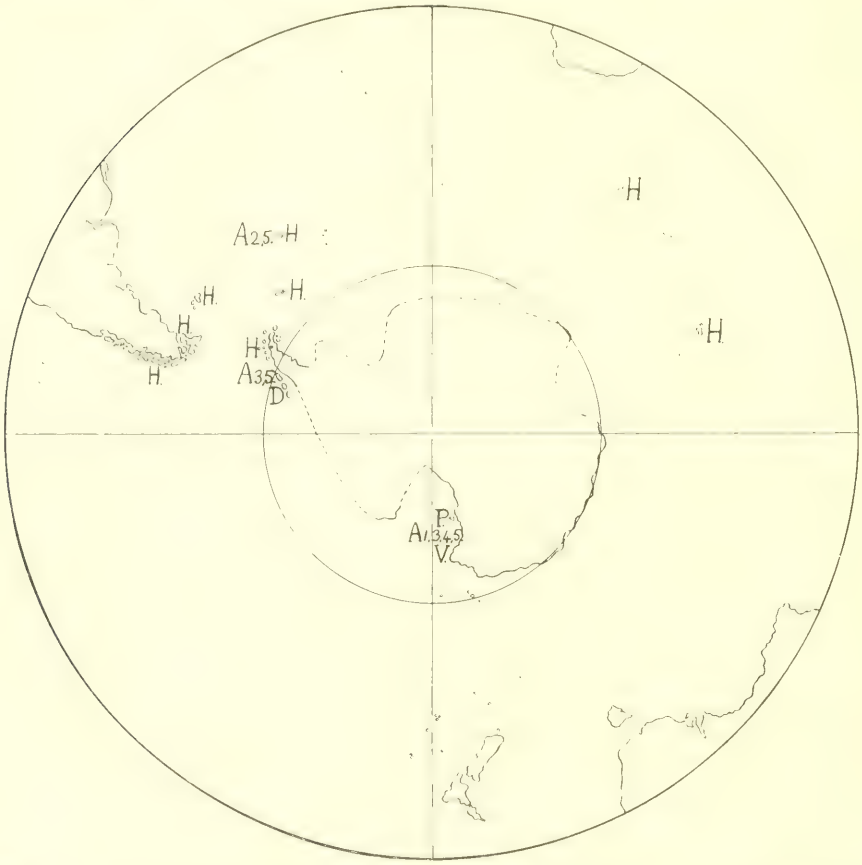


FIG. 5.—Distribution of *Harpagiferinae*: A 1, *Artedidraco orianae*; A 2, *A. mirus*; A 3, *A. skottsbergii*; A 4, *A. shackletoni*; A 5, *A. loennbergii*; D, *Dolloidraco longidorsalis*; V, *Histiodraco velifer*; P, *Pogonophryne scotti*; H, *Harpagifer bispinis*.

MURAENOLEPIDAE. This family comprises but a single genus with one species from Magellan, another from Kerguelen, and a third, *Muraenolepis microps*, from the district now under consideration.

COTTIDAE. *Sclerocottus schraderi*, Fisch., from South Georgia parallels the

Antarctic Zoarcidae as the representative of a northern family generically distinct from the northern members of the group.

In the present state of our knowledge subdivision of the Glacial District would be premature; many of the species are known to have a circumpolar distribution,

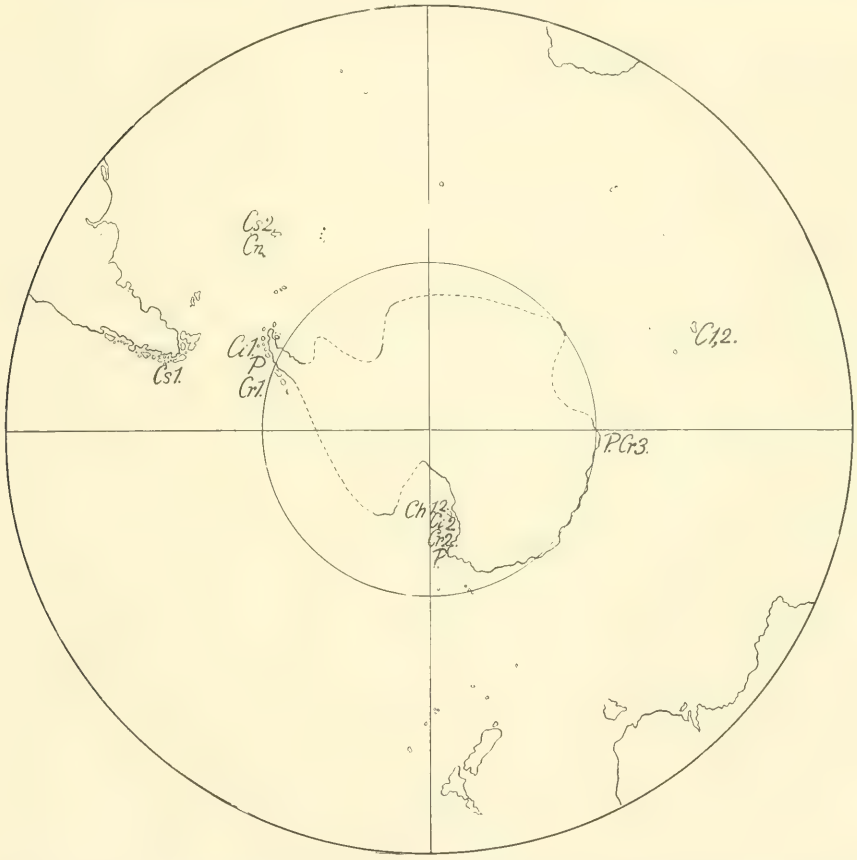


Fig. 6.—Distribution of *Chaenichthyidae:* Cs, *Champsocephalus:* 1, *esox;* 2, *gunnari;* P, *Pagetopsis macropterus;* C, *Chaenichthys:* 1, *rhinoceratus;* 2, *rugosus;* Cn, *Chaenocephalus aceratus;* Cr, *Cryodraco:* 1, *antarcticus;* 2, *atkinsoni;* 3, *pappenheimi;* Ci, *Chionodraco:* 1, *hamatus;* 2, *kathleenae;* Ch, *Chaenodraco:* 1, *wilsoni;* 2, *fasciatus.*

and further researches will doubtless increase their number. It may be noted that from Victoria Land 12 species of *Trematomus* and only one of *Notothenia* have been described, from Graham Land six of *Trematomus* and five of *Notothenia*, and from South Georgia three of *Trematomus* and six of *Notothenia*. That South Georgia is

rightly included can hardly be questioned; of its 15 species of Nototheniiform fishes nine are known also from Graham Land, and the remaining six include species of *Trematomus* and *Artedidraco*, whilst only one (*Champsocephalus gunnari*) has Magellan affinities.

### Kerguelen District.

This includes the island of Kerguelen and also Heard Island, the Crozet Islands, and Marion and Prince Edward Islands.

The fish-fauna of Kerguelen is known from the collections made there by the "Erebus" and "Terror" and the "Challenger"; recently the "Gauss" collected there, but obtained no additional species.

There are two species of the cosmopolitan genus *Raia*; *Muraenolepis marmoratus* is related to *M. microps* and *M. orangiensis* of the Glacial District and of Magellan respectively, and *Zanclorhynchus spinifer* is a genus and species peculiar to the island, its nearest relative being the south temperate *Congiopus* (*Agriopus*).

The rest are Nototheniiformes, viz., five species of *Notothenia*, one of *Harpagifer* and two of *Chaenichthys*. Of these *Notothenia coriiceps* and *Harpagifer bispinis* are found on the coast of the Antarctic continent; the rest are peculiar, but show relationship to species known from South Georgia and Graham Land, for *N. squamifrons* is closely related to *N. larseni*, *N. acuta* to *N. gibberifrons*, *N. mizops* to *N. nudifrons*, and *N. cyanobrancha* to *N. coriiceps*, whilst *Chaenichthys*, a genus peculiar to the island, belongs to the Antarctic family Chaenichthyidae. Little is known of the other islands that may pertain to this area, but it may be noted that at Marion Island *Notothenia marionensis* is the representative of the South Georgian *N. angustifrons*.

At the first glance it may seem that as so many characteristic Antarctic genera appear to be absent and most of the Nototheniidae belong to *Notothenia*, which is well represented in the Subantarctic Zone, the Kerguelen District might be included in the latter. But a more critical examination shows that the *tessellata* group, characteristic of Magellan, is absent, that the *squamifrons*, *acuta* and *marionensis* groups are present and are found elsewhere only in the Glacial District, and that the *coriiceps* group is represented by *N. coriiceps*, an Antarctic species, and by the related *N. cyanobrancha*.

The only way to mark the dissimilarity of the fish-fauna of Kerguelen from that of Magellan or of the subantarctic islands of New Zealand, and to express its affinity to that of Antarctica, is to include it in the Antarctic Zone as a separate district, small and impoverished, but with well-marked characters.

## THE SUBANTARCTIC ZONE.

This includes the Falklands and the southern extremity of South America, northwards about to Chiloe and Cape Blanco, and the extreme south of New Zealand, with the adjacent islands, Stewart, Auckland, Campbell, Antipodes, and perhaps Macquarie. Its limits correspond approximately to the isotherms of 12° C. and 6° C.

A number of South Temperate types extend into this zone, Galaxiidae are characteristic, the Nototheniiformes are represented chiefly by *Notothenia*, and there are several peculiar Zoarcidae.

### Magellan District.

This includes Tierra del Fuego, the coasts of Patagonia northward to Chiloe on the west and Cape Blanco on the east, and the Falkland Islands.

Bovichthyidae are represented by the genus *Cottoperca* (3 spp.), which is confined to this district.

Nototheniidae: *Trematomus*, *Pleuragramma* and the Harpagiferinae except *Harpagifer bispinis* are absent. *Eleginops maclovinus* ranges northward to Valparaiso and Buenos Aires, and *Dissostichus eleginoides* southwards to Graham Land. Peculiar to this area is a natural group of eight species of *Notothenia* (*tessellata* group) comprising all the species with the upper surface and sides of the head, except the snout and praeorbital, scaly, and with the interorbital region rather broad. Two other species (*N. cornucola* and *N. macrocephala*) of quite another type occur also in the Antipodes District, whilst a third (*N. elegans*), not found elsewhere, may be related to *N. cornucola*.

Chaenichthyidae are represented by a species of *Champsocephalus*, a genus that includes one other species from South Georgia.

Zoarcidae: *Unocoetes* (2 spp.), *Phucocoetes* (1 sp.), *Crossostomus* (2 spp.), and *Platea* (1 sp.) are peculiar; *Ophthalmolycus* and *Maynea* each has a species here and another in the Antarctic, whilst *Austrolycus* comprises two species from this district and one from Buenos Aires.

Muraenolepidae. *Muraenolepis orangiensis* is confined to this district, and represents therein the two Antarctic species of the genus.

Galaxiidae. Of six species of *Galaxias* in this district three are known to be marine; *G. maculatus* and *G. gracillimus* have been found in the sea off the Falklands, and the former at Puerto Montt also. The range of the species in the sea is not well ascertained; in fresh water they extend at least to Arauco and to the lakes at the head of the Rio Negro.

The majority of the fishes mentioned above are not known to range outside the district as delimited; the remainder of the fishes that occur within its boundaries are Chilean or Argentine forms.

### Antipodes District.*

This comprises the southern extremity of New Zealand and the islands southward to Campbell Island; whether Macquarie Island should be included is unknown. Most of the few fishes known are New Zealand species; Zoarcidae are absent, and the only

* Subantarctic Islands of New Zealand, Wellington, 1909. Art. xxv. pp. 585–598, Pisces by E. R. Waite.

distinctive feature is the presence of five species of *Notothenia* of the *coriiceps* group, three of them peculiar, and the other two found also in the Magellan District and extending in New Zealand somewhat to the north of the boundaries assigned above. *Galaxias attenuatus* is marine south to Campbell Island and at least as far north as Cook's Straits and Tasmania; in fresh water the genus extends to New Caledonia.*

## B. OCEANIC FISHES.

It has been mentioned above that the Glacial District, for coast fishes, comprises the islands that lie within the extreme limit of pack-ice. It may be of some interest to consider the known distribution of the oceanic fishes, whether pelagic, bathypelagic or abyssal, that have been recorded from within this limit.

### Argentinidae.

The widely distributed genus *Bathylagus* is represented by three species—*B. antarcticus*, Günth., *B. gracilis*, Loennb., and *B. glacialis*, Regan. Of these the first ranges north to 37° S., the second to 49° S., and the third is known only from specimens taken off Coats Land.

### Gonostomatidae.

*Cyclothone microdon*, Günth., is cosmopolitan.

### Stomiatidae.

*Stylophthalmus paradoxus*, Brauer, is a larval form recorded from near Bouvet Island, and also from the South Atlantic and Indian Oceans.

### Sudidae.

*Notolepis coatsii*, Dollo, is a genus and species that may be peculiar to the area within the extreme limit of pack-ice. It is circumpolar (cf. Regan, Trans. R. Soc. Edinb. XLIX, 1913, p. 233); a larva from Graham Land has recently been figured by Prof. Roule (Deuxième Expéd. Antarct. Franç. Poiss. pl. III).

### Myctophidae.

The cosmopolitan genera *Myctophum* and *Lampanyctus* are each represented by a single species. *M. antarcticum*, Günth., is circumpolar, and ranges north to 28° S. *L. brauneri*, Loennb., is known from a specimen from off Coats Land, and another from 49° 56′ S., 49° 56′ W.

* Weber and Beaufort, Zool. Anz. XLII, 1913, p. 172.

### Scopelarchidae.

*Dissomma anale*, Brauer, is known from near Bouvet Island, and from the South Atlantic and Indian Oceans.

### Alepidosauridae.

*Eugnathosaurus vorax*, Regan, is a genus and species known only from off Coats Land.

### Gadidae.

*Melanonus gracilis*, Günth., originally described from the Antarctic, is now known to range in the Atlantic to 36° N.

### Macruridae.

*Cynomacrurus piriei*, Dollo, is a genus and species known only from the type taken off Coats Land. The other species belong to widely distributed genera:—*Chalinura ferrieri*, Regan, and *C. whitsoni*, Regan, are from Coats Land, and the latter from 48° S., 10° W. also. *Nematomurus lecointei*, Dollo, has been taken off Graham Land, near the South Orkneys, and in 48° S., 10° W. *N. armatus*, Hect., is known from near the Crozet Islands and to the north of Wilkes Land, also from the Pacific as far north as 37° N. *Lionurus filicauda*, Günth., ranges north to the latitude of Valparaiso and the La Plata, and has been taken in the Antarctic Ocean to the north of Wilkes Land.

### Bathydraconidae.

As mentioned above, *Bathydraco* certainly and three related genera probably should be classed as oceanic; they are not known to occur beyond the limits of the Glacial District.

### Zoarcidae.

*Lycenchelys antarcticus*, Regan, from near the South Orkneys, is the first southern species of *Lycenchelys*.

### Brotulidae.

*Holcomycteronus bracei*, Dollo, is from near the South Orkneys; a second species has been described by Garman from 2°–26° N., 82°–110° W.

### Cyclopteridae.

*Liparis steineni*, Fisch., and *Careproctus georgianus*, Loennb., from South Georgia, and *Paraliparis antarcticus*, Regan, from Victoria Land, are the Antarctic representatives of genera that seem to be cosmopolitan, but may be best represented in northern seas and include many deep water species.

Our knowledge of the distribution of the pelagic and deep sea fishes of the Antarctic Ocean is obviously not sufficiently complete to permit of an attempt to co-ordinate the results so far obtained.

## 2. THE ANTARCTIC CONTINENT DURING THE TERTIARY PERIOD.

Many authorities believe that in the early Tertiary the Antarctic continent was connected with Australia and with South America; some think with Africa also. The distribution of the Fishes, and of other groups of animals, has been considered to support this hypothesis.

### Fishes.

The distinctive features of the fish-fauna of the coasts of Antarctica are that nearly all the genera and species are peculiar and that they nearly all belong to a single group, the Nototheniiformes, which is characteristic of and almost restricted to the Antarctic and Subantarctic Zones. In the Antarctic Zone this group has developed into a large number of types that differ greatly in structure, appearance and habits. These facts seem to point to the conclusions that Antarctica may have long been isolated and that its coasts may have been washed by a cold sea for a long time, probably throughout the Tertiary Period.

It has been suggested that identical or related species of different parts of the South Temperate Zone are part of the fauna of the coasts of an Antarctic continent that formerly connected America, Africa and Australia. It is very difficult to make this view harmonise with the facts. Tristan da Cunha and St. Paul, 4,500 miles apart, have at least two species of shore fishes (*Labrichthys ornatus* and *Chilodactylus monodactylus*) in common. Have these persisted unchanged whilst the coasts of Antarctica have receded to their present position, and whilst the fauna of Kerguelen has become differentiated? It seems far more likely that the distribution of these species is due to present conditions; Tristan da Cunha and St. Paul are nearly in the same latitude and on the same isotherm, and the Antarctic Drift runs directly from one to the other. In all probability it will be found that the species common to both islands have floating eggs and larvae that swim at the surface; it is even possible that the adult fish may occasionally migrate from one island to the other. The case of related species, as for example *Seriolella velaini* from St. Paul, and *S. antarctica* from Tristan da Cunha, may be explained on similar lines; it is evident that the distance between the islands is too great to be traversed by these species, but under somewhat different conditions the parent form may have lived at both and either at the Cape or at Marion and the Crozets, or at other islands that may have existed and served as stepping stones, but have now disappeared. Whatever may be the true explanation, it is certain that the construction of

Tertiary land-bridges to account for all cases of this sort would reduce the oceans to a few puddles.

Much has been made of the distribution of the Galaxiidae and Haplochitonidae, for some time regarded as fresh-water fishes found in Southern Australia and Tasmania, New Zealand, and the southern part of America. It is now known that *Galaxias attenuatus*, the only species common to all these regions, breeds in the sea. In the "Scotia" report I have shown that these two families are Salmonoids related to the Osmeridae, and their marine origin may be regarded as certain. Like the northern Salmonoids they are establishing themselves in fresh water, and it is interesting to note that *Galaxias* occurs at the Cape and even in New Caledonia, where, like the Trout of Algeria, it remains as the witness of a glacial epoch.

None of the families of true fresh-water fishes of either South America or Africa occurs in Australia, except the Osteoglossidae, a generalised and ancient type. Even in this case the relationship is not with America or Africa, but with Asia, *Scleropages* comprising one species from Queensland and New Guinea, and one from Borneo and Sumatra.

Thus neither marine nor fresh-water fishes support the theory that the Antarctic continent connected America with Australia during the Tertiary Period. This being the case, I have been led to examine somewhat critically the other zoogeographical evidence in support of this theory. Some of this is derived from the similarity of marine faunas, or from the distribution of fresh-water organisms that may have had a marine origin. Of more importance are the land animals, and Dollo, in his monumental report on the "Belgica" fishes, comes to the conclusion, "C'est *l'Antarctide Tertiaire* de M. Osborn—ou une Antarctide analogue, indispensable pour les *Marsupiaux* et *Miolania*—qui explique le mieux la *Biogéographie* des *Poissons Antarctiques* et *Sub-antarctiques*." Unable to accept this for the Fishes, I have looked into the question of the Marsupials and *Miolania*.

## Marsupials.

It has been suggested that *Caenolestes* and the extinct Patagonian members of the Epanorthidae may be related to the Australian group Diprotodontia. This is by no means generally accepted, and several authorities believe that the Epanorthidae may have been derived from a primitive Didelphoid type which has evolved a diprotodont dentition independently. This view is supported by the fact that the Epanorthidae are eleutherodactyle, whereas the Australian Diprotodonts are syndactyle.*

It has recently been shown by Gidley † that the Multituberculates are "Diprotodonts," so that Marsupials of this type date back to the Triassic, and even if they be monophyletic, their occurrence in Australia and South America loses its significance.

* Thomas, Proc. Zool. Soc. 1895, p. 870; Gregory, Bull. Amer. Mus. xxvii, 1910, p. 211.

† Proc. U. S. Nat. Mus. xxxvi, 1909, p. 611.

Recently some American writers * claim to have proved the relationship of the Sparassodonts of Ameghino, *Borhyaena*, *Prothylacinus*, etc., of the Miocene of Patagonia to the Tasmanian *Thylacinus*, and even unite them in a family Thylacinidae, distinct from the Dasyuridae; for this there seems to be but little justification.

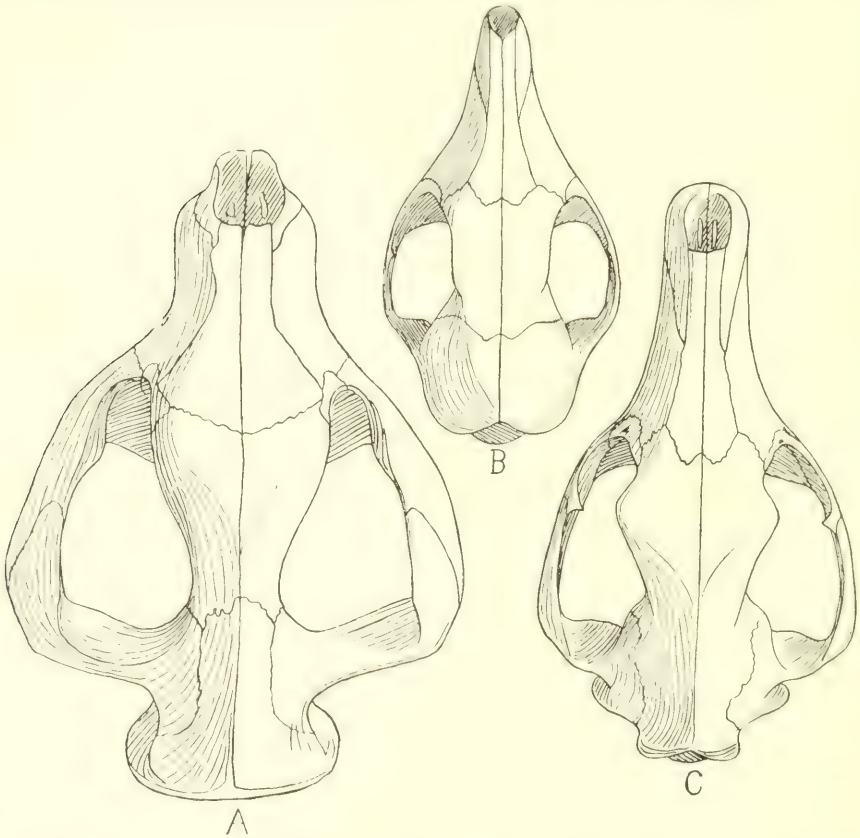


FIG. 7. Skulls of A, *Borhyaena tuberata* (after Sinclair); B, *Phascologale dorsalis* (after Thomas), and C, *Thylacinus cynocephalus*; seen from above. *Phascologale* has been selected for comparison as a small insectivorous type, differing from the large carnivorous *Thylacinus* in the form of the cranium and zygomatic arch, but resembling it in many important structural characters.

Tomes † has shown that in *Borhyaena* the enamel of the teeth resembles in structure that of Creodonts and Carnivores, lacking tubules, and with the groups of

* Sinclair, Rep. Princeton Exped. Patagonia, IV, 1901, p. 333; Gregory, Bull. Amer. Mus. XXVII, 1910, p. 207.

† Proc. Zool. Soc. 1906, I, p. 45.

prisms interlacing to produce a characteristic pattern in cross-section. In *Thylacinus* and *Dasyurus*, on the contrary, the enamel is typically Marsupial in that it is penetrated by tubules continuous with those of the dentine and has the prisms straight and parallel. The two genera mentioned show a special agreement in that the tubules end at some distance from the surface. Ameghino states that in the Sparassodonts not only the third praemolar, but the canine and sometimes the second praemolar, have deciduous predecessors. In *Thylacinus*, as in the other Dasyuridae, only the third praemolar is preceded by a milk tooth. I have examined the skulls of *Thylacinus* and several other Dasyuridae (Fig. 7, B, C) and find that they agree in having the orbits well backward, the nasal processes of the praemaxillaries long, the nasals but moderately expanded posteriorly, the maxillary and frontal meeting in a suture, the jugal emitting a postorbital process just before its junction with the squamosal, the occipital region triangular in outline, the basisphenoid foramina paired and palatal vacuities present (said to be absent in some species of *Phascologale*).

The Sparassodonts, as described and figured in Sinclair's admirable monograph, differ in the more anterior position of the orbits, shorter nasal processes of the praemaxillaries, nasals strongly expanded posteriorly, meeting the lachrymals and separating the maxillaries from the frontals, the absence of a distinct postorbital process, the semicircular occipital outline, the unpaired basisphenoid foramen, and the absence of palatal vacuities (Fig. 7, A).

The dentition of *Thylacinus* is readily derivable from the primitive Dasyurid type (*Phascologale*); the teeth of the Sparassodonts correspond closely to those of *Thylacinus* in form and number, except that the metacone of the fourth upper molar is vestigial or absent, whereas in *Thylacinus* it is well-developed.

There appears to be no escape from the conclusion that *Thylacinus* is a true but aberrant member of the Dasyuridae, and that it has nothing to do with the Borhyaenidae, a family well characterised by peculiarities in the skull, and in the structure and perhaps in the succession of the teeth. The specialised carnivorous dentition, superficially similar to that of *Thylacinus*, has been independently evolved.

## Miolania.

The family Miolaniidae includes some large extinct Pleurodiran Tortoises that are remarkable for the development of a caudal sheath of bony rings and the presence of dermal bony bosses on the head.

There are two genera, *Miolania*, Owen, and *Niolamia*, Ameghino. The former includes two species, *M. platyceps*, Owen,* from the Pleistocene of Lord Howe Island, and *M. oweni*, A. S. Woodward,† from the Pleistocene of Queensland. *Niolamia*

* Owen, Phil. Trans., 1886, pp. 471–480, pls. xxix, xxx; and 1888, pp. 181–191, pls. xxxi–xxxvii.
† Woodward, Ann. Mag. Nat. Hist. (6) i, 1888, p. 89.

comprises a single species, *N. argentina*, Ameghino,* from Patagonian deposits that were at first stated to be Cretaceous, but may prove to be Miocene.

In *Miolania* (Fig. 8, B) the skull, seen from above, is somewhat oblong in form, with the snout broadly rounded. The dermal bosses all have the appearance of separate elements. On the upper surface may be recognised a large but low parietal pair; behind them is an occipital pair that project backwards, and in front of them a smaller frontal pair mesially, and a postfrontal pair laterally. A pair of subconical bosses, rounded or ovate in transverse section, on each side of the parietal pair, project as lateral "horns"; a much smaller pair are placed directly in front of them. Other features of the genus that may be mentioned are that the praemaxillaries have a median pit for the reception of the symphysial beak of the mandible, that the palatal extensions of the praemaxillaries and maxillaries bear two sharp ridges within

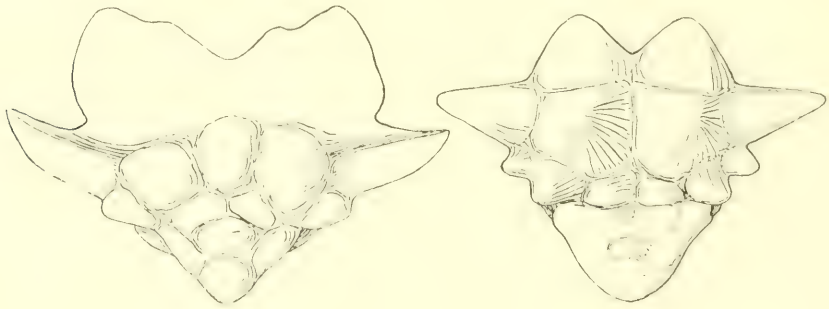


FIG. 8.—Skulls of A, *Niolamia argentina*, and B, *Miolania oweni*, seen from above. In B the position of the anterior margin of the praemaxillaries is indicated by a dotted line.

and parallel to the margin of the upper jaw, that the nasals project beyond the praemaxillaries, and that there is a bony internasal septum.

In *Niolamia* (Fig. 8, A) the skull is nearly triangular in outline, with the snout more acute than in *Miolania*. The bosses differ considerably from those of *Miolania*, as there are three instead of two parietal bosses, the occipital pair are enormous laminar expansions, the lateral "horns" are broad and flat, triangular in section, and have no smaller pair in front of them. Further differences from *Miolania* are that the praemaxillaries are not pitted, the mandible is not beaked, the upper jaw has a single blunt intramarginal ridge, the nasals do not project beyond the praemaxillaries, and there is no internasal septum.

These differences have already been pointed out by Dr. Smith Woodward (Proc. Zool. Soc. 1901, I, pp. 174–176), but he has not insisted on them so much as on

* Woodward, Proc. Zool. Soc., 1901, I, p. 170, pls. XV–XVIII.

the essential similarity of the American and Australian fossils, which he included in one genus, *Miolania*. However, admitting their relationship and their distinctness from all other Chelonians, it seems to me that these two well-marked types may be regarded as different genera. If it be considered that several recent genera of the Chelonia are represented in the Eocene by species quite like the modern ones, the occurrence in Australia and South America of types so dissimilar—one of which dates back at least to the time when Lord Howe Island was part of the continent of Australia, and the other is known from deposits that may be Miocene or perhaps earlier—can be explained without inventing a Tertiary land-bridge.

The conclusion is that neither the fresh-water fishes, nor the marine fishes, whether Antarctic or South Temperate, support the theory that Antarctica has connected Australia with South America in Tertiary times, nor, so far as I can read the evidence, does the distribution of other groups of animals confirm this view.

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## EXPLANATION OF THE PLATES.

### PLATE I.

FIG. 1.—Trematomus bernacchii.
,, 2.— ,, hansoni.

### PLATE II.

FIG. 1.—Paraliparis antarcticus.
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,, 3.—Trematomus brachysoma.

### PLATE III.

FIG. 1.—Trematomus centronotus.
,, 2.— ,, pennellii.

### PLATE IV.

FIG. 1.—Trematomus lepidorhinus.
,, 2.— ,, scotti.
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### PLATE V.

FIG. 1.—Artedidraco skottsbergii.
,, 2.— ,, loennbergii.
,, 3.—Histiodraco velifer.

### PLATE VI.

FIG. 1.—Pogonophryne scotti (reduced to $\frac{5}{6}$).
,, 2.—Artedidraco orianae.

### PLATE VII.

FIG. 1.—Prionodraco evansii.
,, 2.—Cryodraco atkinsoni (reduced to $\frac{5}{6}$).

### PLATE VIII.

Chionodraco kathleenae (reduced to $\frac{2}{3}$)

### PLATE IX.

FIG. 1.—Chaenodraco wilsoni.
,, 2.— ,, fasciatus.

### PLATE X.

FIG. 1.—Xystreurys brasiliensis.
,, 2.—Idiacanthus niger.

## PLATE XI.

FIG. 1.—Prionotus brachychir.
" 2.—Arnoglossus mongonuiensis.
" 3.—Serranops maculicauda.
" 4.—Lepidoperca inornata.

## PLATE XII.

FIG. 1.—Hemerocoetes pauciradiatus.
" 2.— " macrophthalmus.
" 3.—Pyramodon punctatus.
" 4.—Notopogon lilliei.
" 5.— " xenosoma.

## PLATE XIII.

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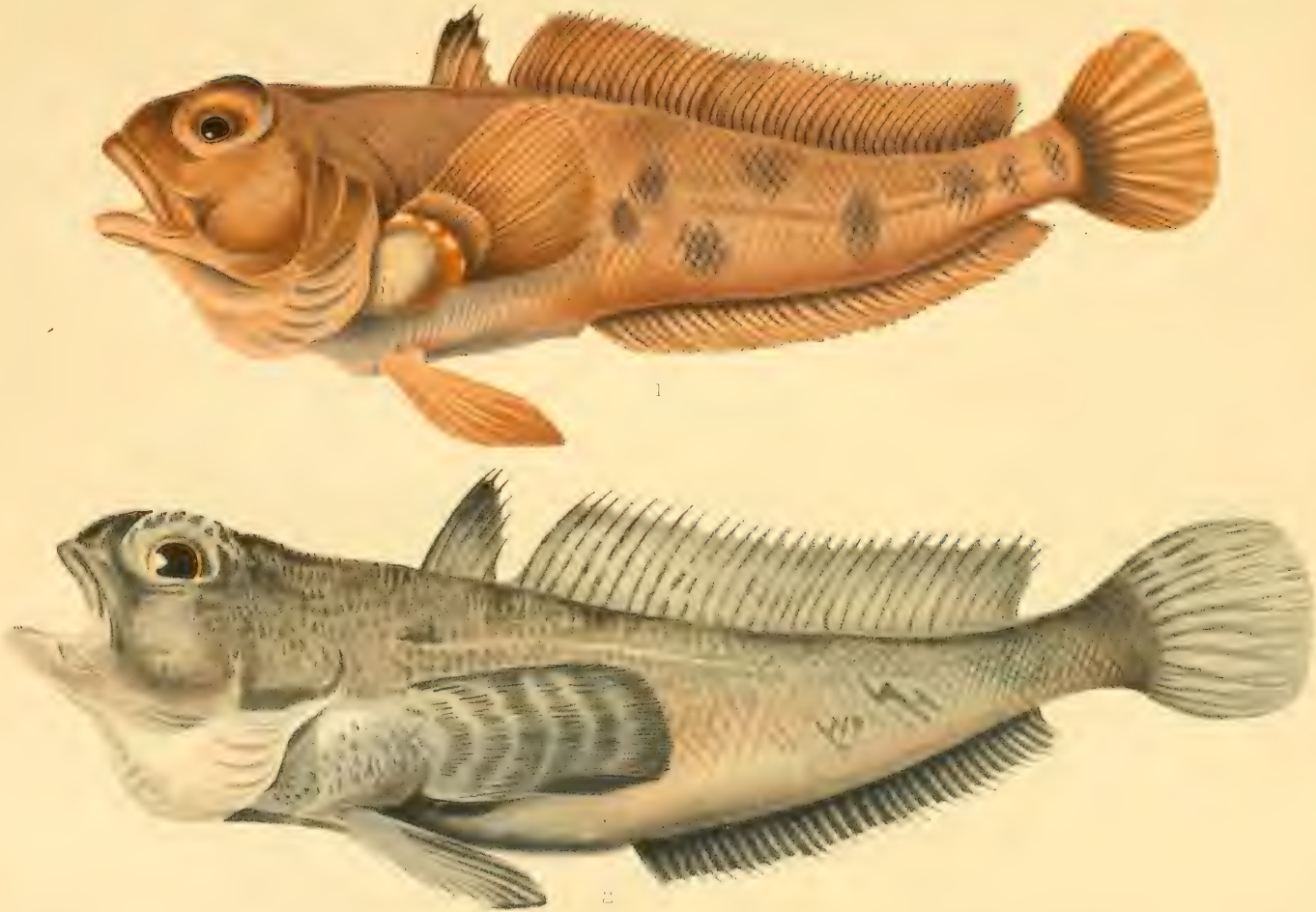


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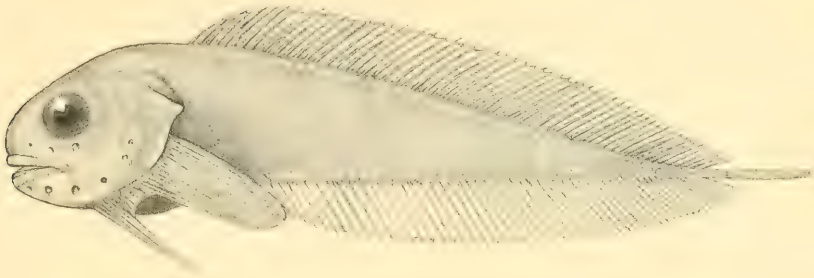
Fishes, Pl. I



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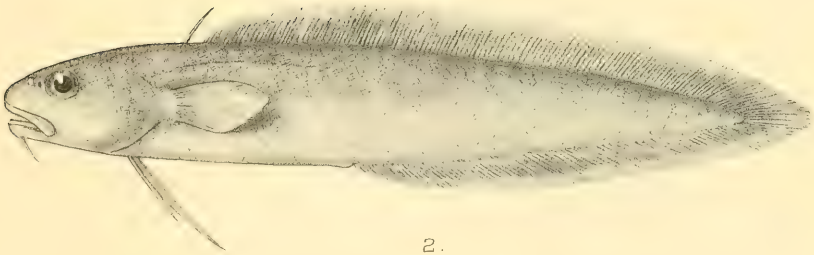

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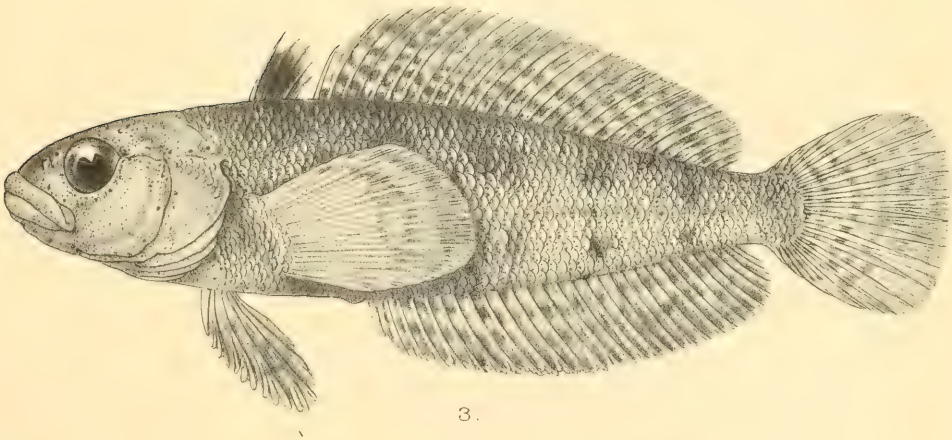

3.

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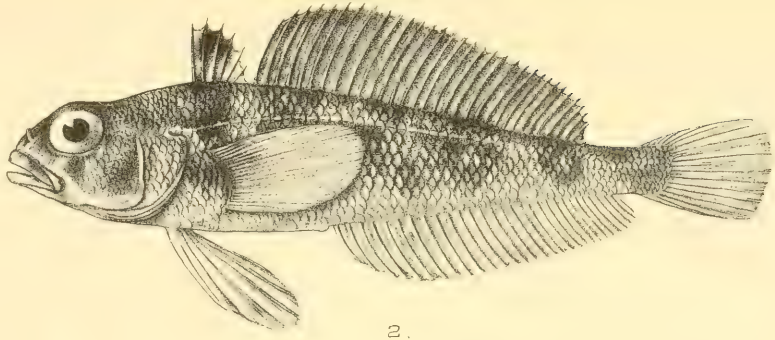

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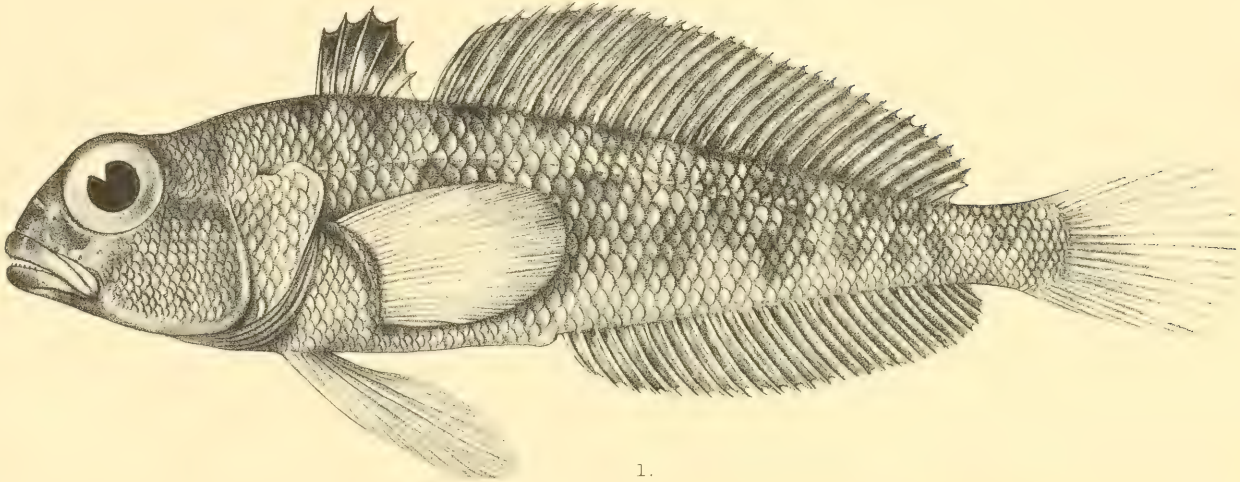

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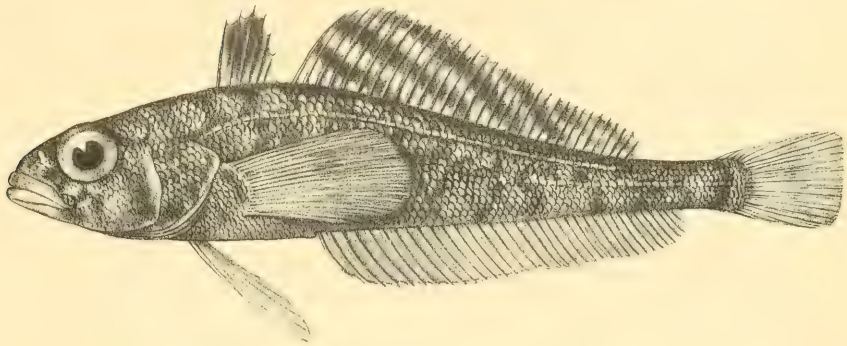
1. Trematomus centronotus. 2. Trematomus.

Fishes. Pl III



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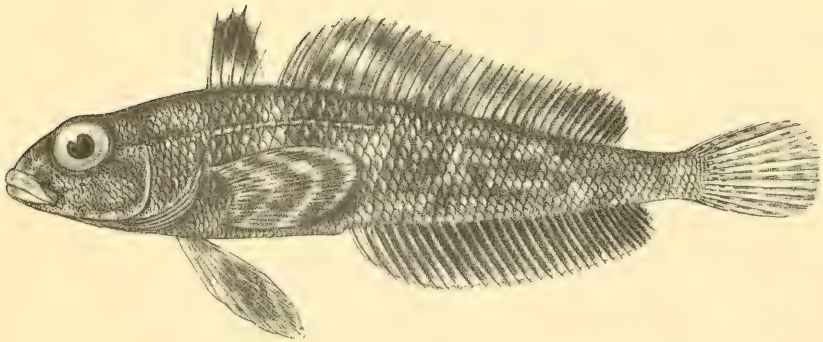

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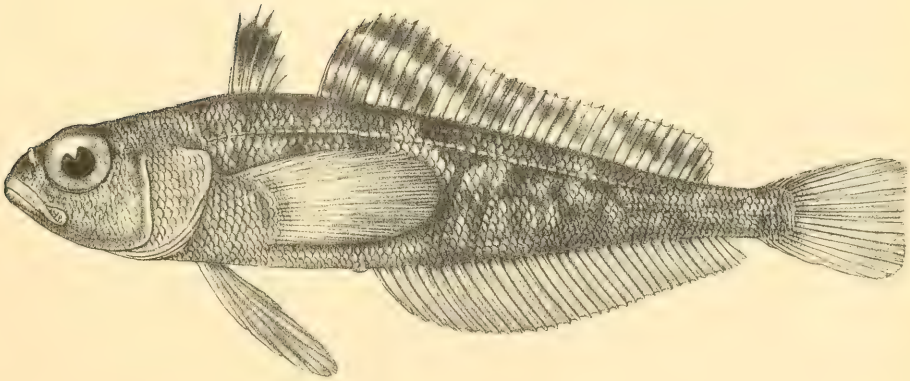

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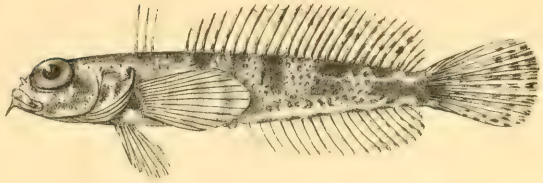
1. Trematomus lepidorhinus. 2. T. scotti. 3. T. eulepidotus.



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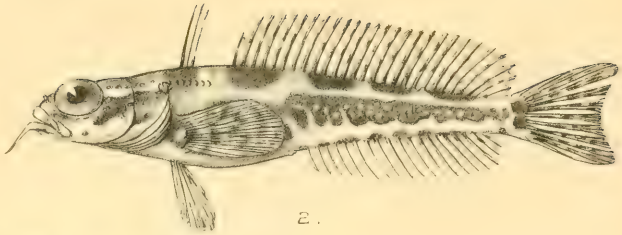

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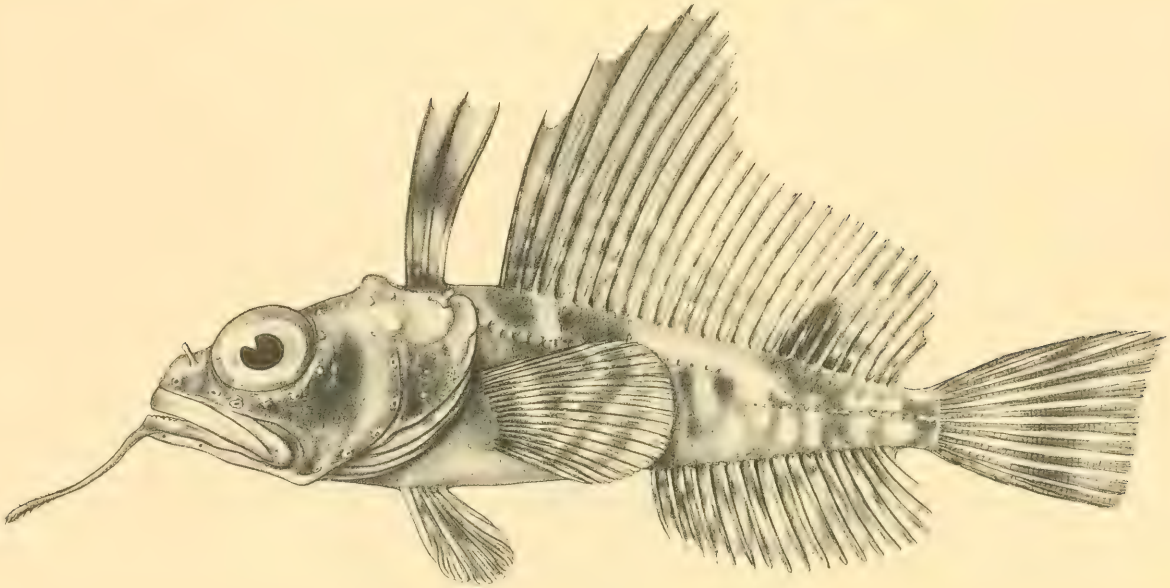

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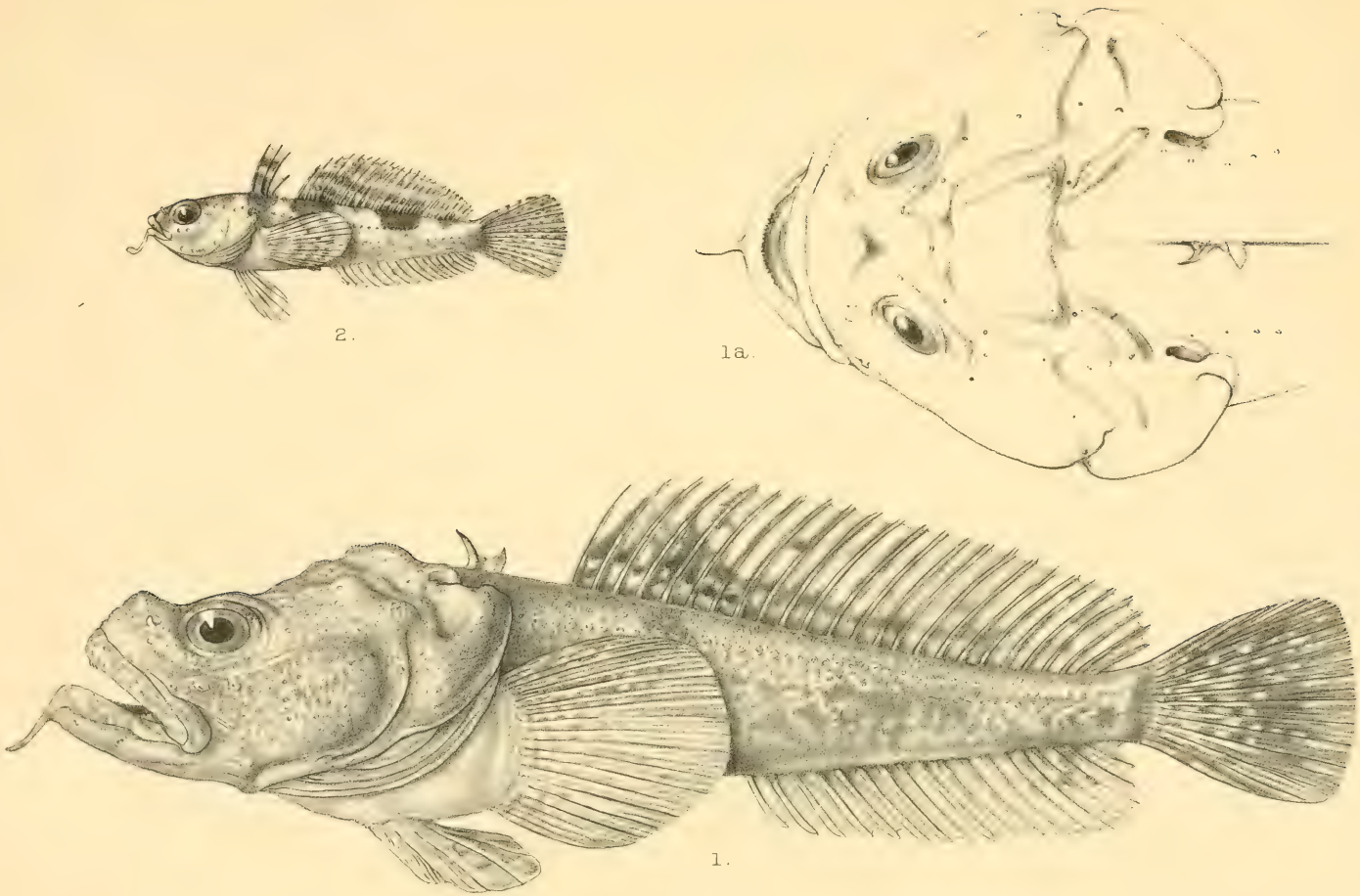
1. Artedidraco skottsbergi. 2. A. loennbergi. 3. Histiodraco velifer.

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1. Pogonophryne scotti. 2. Artedidraco orianae.

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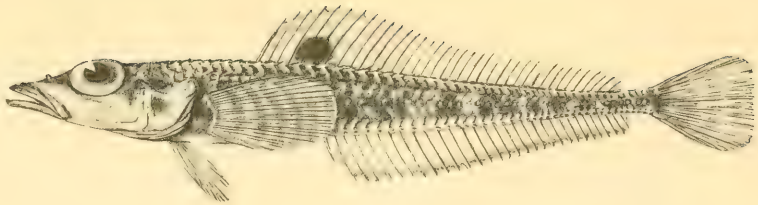

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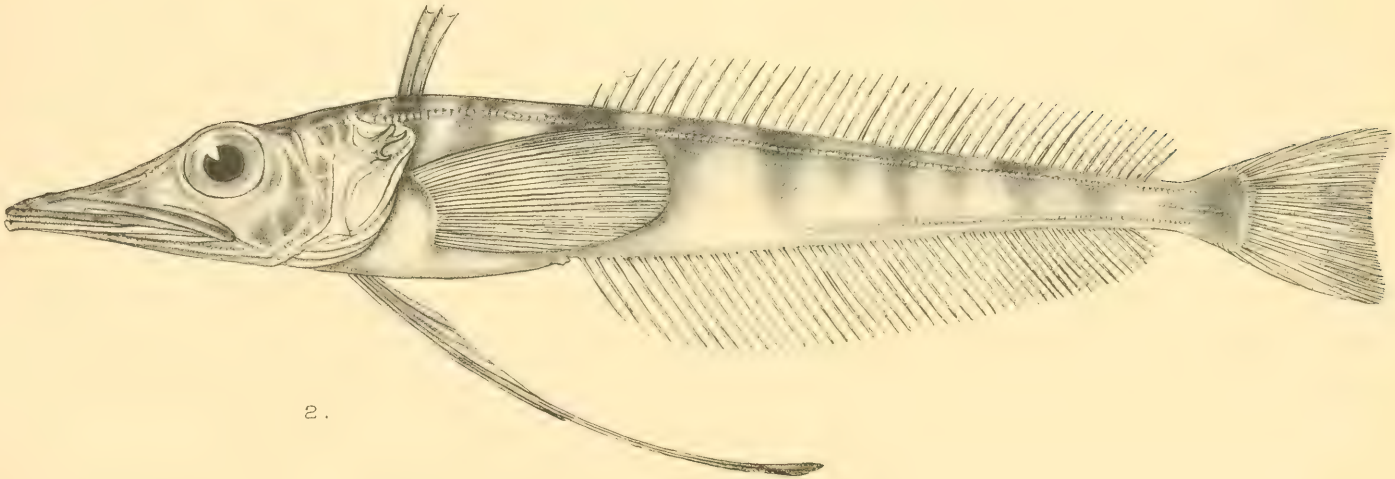

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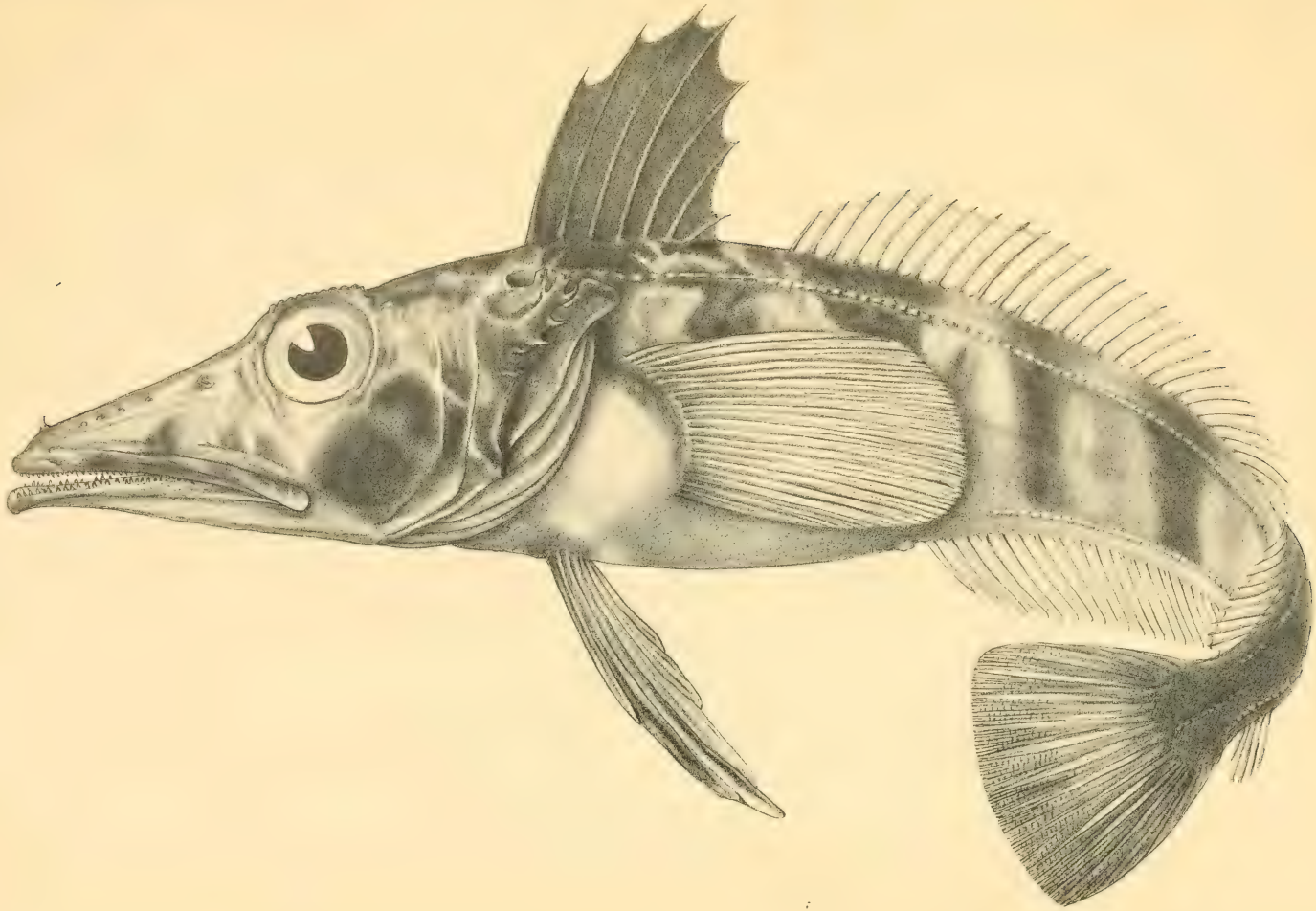
1. Prionodraco evansii. 2. Cryodraco atkinsoni.

Fishes, Pl. VII.



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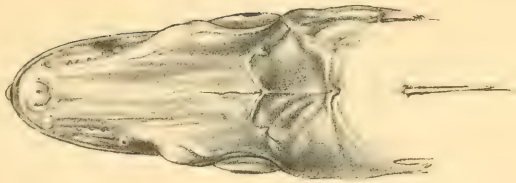
Chionodraco kathleenae.

Fishes Pl. VIII.



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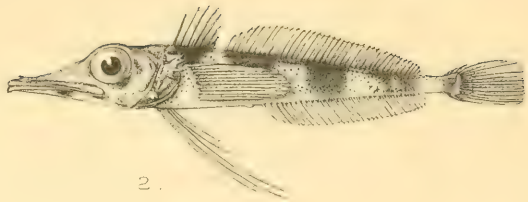

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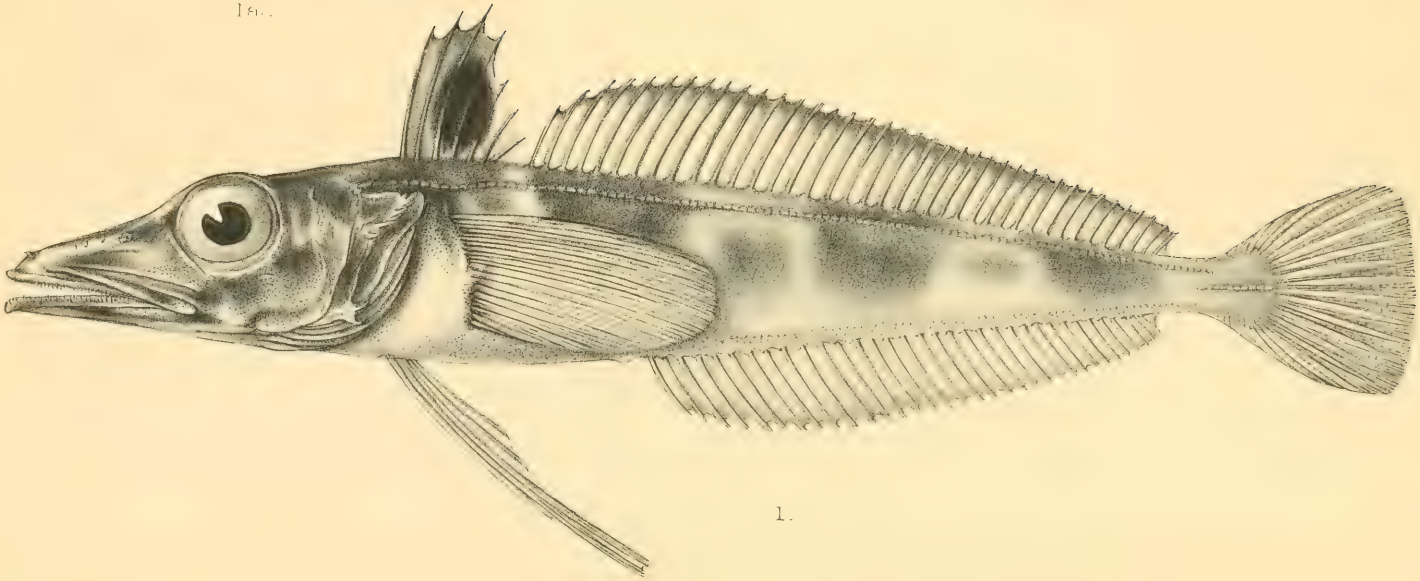

1.

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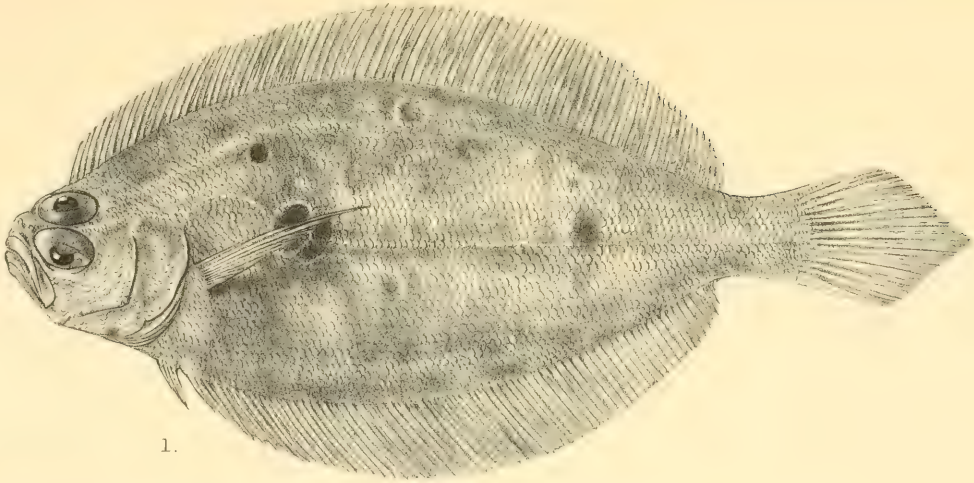
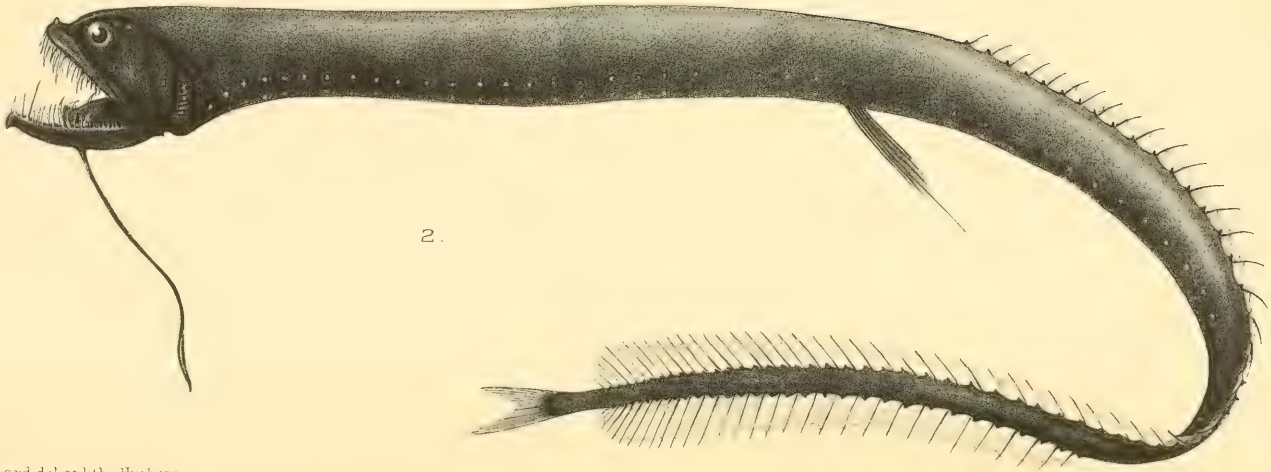
1. Cheneodraco wilsoni. 2. C. fasciatus

Fishes, Pl. IX.

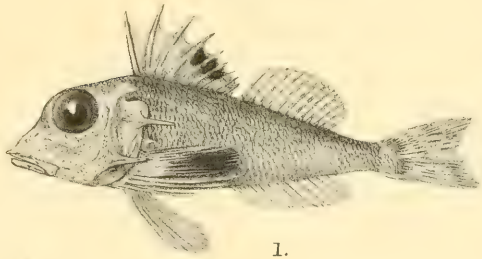



G M W Edward del et lith Huth imp

1. Xystreurys brasiliensis. 2. Idiacanthus niger.

Fishes, Pl. X.



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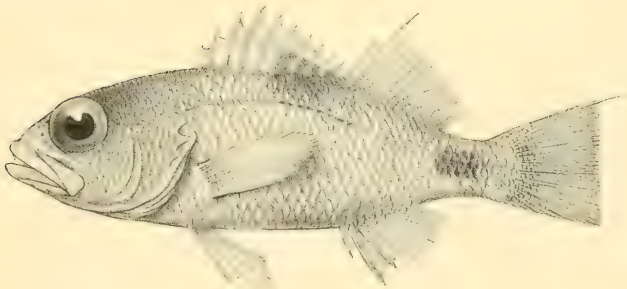

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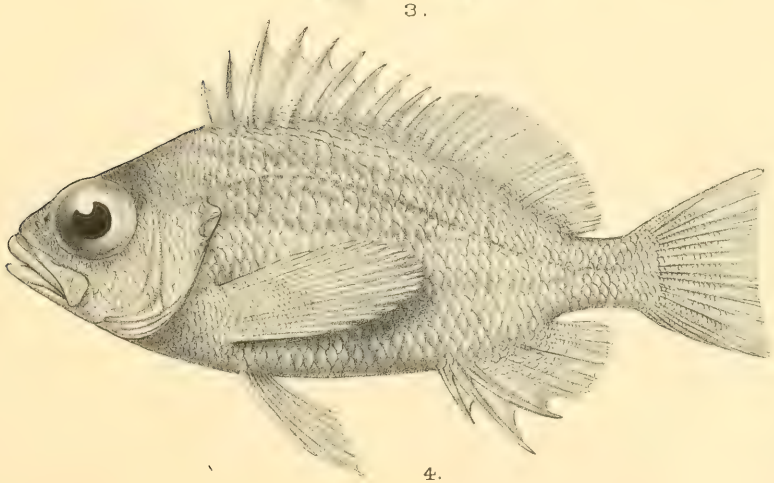
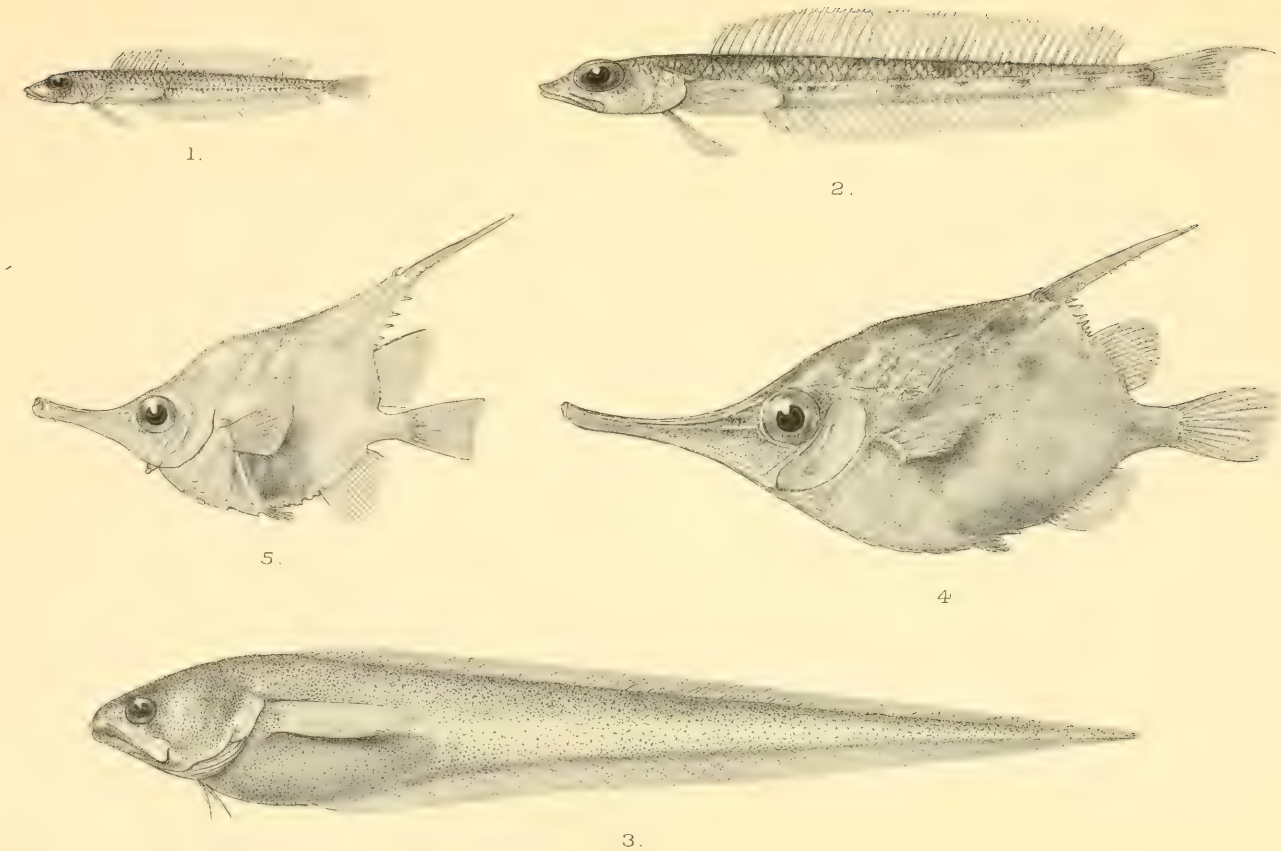


4.

G. M. Woodward del. et lith. Huth imp.

1. Prionotus brachychir. 2. Arnoglossus mongonuiensis.
3. Serranops maculicauda. 4. Lepidoperca inornata.




G. M. Woodward del. et lith., Huth imp.

1. Hemerocoetes pauciradiatus. 2. H. macrophthalmus. 3. Pyramodon punctatus. 4. Notopogon lilliei. 5. H. xenosoma.

Fishes, Pl. XII

G. M. Woodward del. et lith.

Huth imp.

Psammobatis cirrifer.

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